# AMSR-E
# Data Management Plan


June 2003

# 1   INTRODUCTION

The Advanced Microwave Scanning Radiometer - EOS (AMSR-E) was built by NAtional Space Development Agency (NASDA) of Japan. AMSR-E is flying on the National Aeronautics and Space Administration's (NASA) Aqua Platform that was launched May 4, 2002.  AMSR-E improves upon the window frequency radiometer heritage of the Scanning Multichannel Microwave Radiometer (SMMR), Special Sensor Microwave/Imager (SSM/I) and Tropical Rainfall Measuring Mission (TRMM) Microwave Instrument (TMI) instruments.  Major improvements over those instruments include channels spanning the 6.9 GHz to 89 GHz frequency range, and higher spatial resolution from the 1.6 m. reflector.

NASA funds the AMSR-E Science Team to provide algorithms for the routine production of a number of standard geophysical products.  These products will be generated by the AMSR-E Science Investigator-led Processing System (SIPS) at the Global Hydrology and Climatology Center (GHCC) in Huntsville, Alabama.  The U.S. Team's standard products will be archived at the National Snow and Ice Data Center (NSIDC), in Boulder, Colorado.  Further information about AMSR-E can be obtained at http://www.ghcc.msfc.nasa.gov/AMSR.

## 1.1   Scope of the document

This document will allow the user to understand what happens to all AMSR-E data: space science data, validation data, browse images and research products.  The organization of the data management team is described in section 3; an overview of the hardware and its estimated requirements is described in section 4; the data flow with details on the volumes, type of files and ancillary files used in processing is described in section 5.  Section 6 gives details of the data processing at the SIPS, and section 7 describes the data distribution and archival at NSIDC.  The implementation schedule is in section 8.

# 2 Documentation

## 2.1 Science Team

Algorithm Theoretical Basis Document (ATBD), AMSR Level 2A algorithm, Peter Ashcroft and Frank J. Wentz, Remote Sensing Systems

Algorithm Theoretical Basis Document (ATBD), Version 2, AMSR Ocean algorithm, Principal Investigator: Frank J. Wentz, Co-Investigator: Thomas Meissner, Remote Sensing Systems

EOS/AMSR Rainfall, Algorithm Theoretical Basis Document (ATBD), Thomas Wilheit, Christian Kummerow, Ralph Ferraro

Algorithm Theoretical Basis Document (ATBD) for the AMSR-E Snow Water Equivalent algorithm, Alfred T.C. Chang/Code 974, NASA/GSFC, Albert Rango/ Hydrology laboratory, USDA/ARS, Version 3.0

Algorithm Theoretical Basis Document (ATBD) for the AMSR-E Sea Ice algorithm, Donald J. Cavalieri and Josefino C. Comiso, Laboratory for Hydrospheric Processes, NASA Goddard Space Flight Center

Algorithm Theoretical Basis Document, AMSR Land Surface parameters, Version 3.0, Eni G. Njoku, Jet Propulsion Laboratory

Advanced Microwave Scanning Radiometer for EOS (AMSR-E), Science Data Validation Plan, Version 2

All the above documents can be found at: http://eospso.gsfc.nasa.gov/atbd/amsrtables.html

## 2.2 TLSCF

Advanced Microwave Scanning Radiometer (AMSR) Team Science Computing Facility (SCF) Plan

Software Management Plan for the Earth Observing System PM-1 Advanced Microwave Scanning Radiometer (AMSR-E), January 1998

Data Catalog

Q/A Plan

## 2.3 SIPS

Advanced Microwave Scanning Radiometer (AMSR-E) Science Investigator-led Processing System (SIPS) Configuration Management Plan

Advanced Microwave Scanning Radiometer (AMSR-E) Science Investigator-led Processing System (SIPS) Security Plan

Interface Control Document Between The Advanced Microwave Scanning Radiometer-EOS Science Investigator-led Processing System (AMSR-E SIPS) and the AMSR-E Team Lead Science Computing Facility (TLSCF)

Operations Agreement For The Advanced Microwave Scanning Radiometer-EOS Science Investigator-led Processing System (AMSR-E SIPS) between Remote Sensing Systems and NASA / Global Hydrology & Climate Center

Operations Agreement For The Advanced Microwave Scanning Radiometer-EOS Science Investigator-led Processing System (AMSR-E SIPS) between Remote Sensing Systems and NASA / Jet Propulsion Laboratory (PO.DAAC)

Operations Agreement Between Global Hydrology & Climate Center (GHCC) and The National Snow and Ice Data Center (NSIDC) Distributed Active Archive Center (DAAC) For Transfer of Advanced Microwave Scanning Radiometer-EOS (AMSR-E) Level 2 and Level 3 Data Products

| | |
|---|---|
| 423-41-57 | Interface Control Document  Between ECS and the Science Investigator-led Processing Systems (SIPS) Volume 0 Interface Mechanisms |
| 423-41-57-7 | Interface Control Document between the EOSDIS Core System (ECS) and the Science Investigator-Led Processing System (SIPS). Volume 7: AMSR-E Science Investigator-Led Processing system Data Flows |
| 423-42-03 | Interface Responsibilities for Standard Product Generation Using Science Investigator-Led Processing Systems (SIPS) |
| 423-41-57-9 | Interface Control Document between the EOSDIS Core System (ECS) and the Science Investigator-led Processing System (SIPS) Volume 9: Machine-to-Machine Search and Order Gateway, March 2000 |

## 2.4  DAAC

| | |
|---|---|
| 422-12-17-04 | AMSR-E Project Implementation Plan Volume II (Science Team, Algorithm Development, and Data Processing) |
| 423-41-02 | Functional and Performance Requirements Specification for the Earth Observing System Data and Information System (EOSDIS) Core System |
| 423-41-01 | EOSDIS Core System (ECS) Statement of Work |
| 423-10-01-0 | Earth Science Data and Information System (ESDIS) Project Level-2 Requirements, Volume 0: Overall EOS Ground System (EGS) |
| 423-10-01-5 | Earth Science Data and Information System (ESDIS) Project Level-2 Requirements, Volume 5: EOSDIS Version 0 |
| 305-CD-600-001 | Release 6A Segment/Design Specification for the ECS Project, March 2001 |
| 313-CD-600-001 | Release 6A ECS Internal Interface Control Document for the ECS Project, March 2001 |
| 420-TP-022 | Release 6A Implementation Earth Science Data Model |
| 230-TP-002-003 | Interface Control Document between the ECS and Product Distribution System Information Server (PDSIS), April 2001 |

| | |
|---|---|
| 230-WP-001-003 | Machine-to-Machine Search and Order Gateway Interface for the ECS Project, June 2000 |
| 423-41-58 | Interface Control Document between ECS and the Science Investigator-led Processing Systems (SIPS) Volume 0 Interface Mechanisms |
| 423-41-57-7 | Interface Control Document between the EOSDIS Core System (ECS) and the Science Investigator-led Processing System (SIPS). Volume 7: AMSR-E Science Investigator-led Processing system Data Flows |
| 423-42-03 | Interface Responsibilities for Standard Product Generation Using Science Investigator-led Processing Systems (SIPS) |
| 423-41-57-10 | Interface Control Document between the EOSDIS Core System (ECS) and the Science Investigator-led Processing System (SIPS) Volume 9: Machine-to-Machine Search and Order Gateway, March 2000 |
| 505-41-11 | Interface Requirements Document between the Earth Observing System Data and Information System (EOSDIS) Core System (ECS) and Version 0 System, August 1997 |
| 505-41-33 | Interface Control Document between EOSDIS Core System (ECS) and Science Computing Facilities (SCF), December 1999. |
| 423-41-45 | Interface Control Document between EOSDIS Core System (ECS) and the National Snow and Ice Data Center (NSIDC) DAAC |
| NPG 2810.1 | NASA Procedures and Guidelines, Security of Information Technology |
| NPD 2810.1 | NASA Policy Directive, Security of Information Technology |
| | Office of Management and Budget (OMB) Circular No. A-130, Appendix III |
| 608-CD-001-006 | EOSDIS Core System (ECS) Science Operations Plan |
| 423-ICD-EDOS/EGS | Interface Control Document between the Earth Observing System (EOS) Data and Operations System (EDOS) and the EOS Ground System (EGS) Elements |
| | The Earth Observing System (EOS) Reference Handbook, A Guide to NASA's Earth Science Enterprise and the Earth Observing System. 1999. |
| | Operations Agreement between Global Hydrology & Climate Center (GHCC) and the National Snow and Ice Data Center (NSIDC) Distributed Active Archive Center (DAAC)) for Transfer of Advanced Microwave Scanning Radiometer-EOS (AMSR-E) Level 2 and Level 3 Data Products |
| | Operations Agreement between The National Space Development Agency (NASDA) Earth Observation Center (EOC) and the National Snow and Ice Data Center (DAAC) Distributed Active Archive Center (DAAC) for Transfer of Aqua AMSR-E Level 1A Processing Software |

Operations Agreement between The National Space Development Agency (NASDA) Earth Observation Center (EOC) and the National Snow and Ice Data Center (DAAC) Distributed Active Archive Center (DAAC) for Exchange of AMSR-E Level 0 Science and Ground Based Attitude Determination (GBAD) Data

# 3  Data Management Team Organization

## 3.1  Data Management Team Head

Roy Spencer, AMSR-E Science Team Leader, is also the Data Management Team head.  As the Project matures some of Dr. Spencer's responsibilities change.  During the early phases of the AMSR-E Project his full attention was on his responsibilities as a Science Team Leader.  After Aqua launch, some of the Science Team Leader responsibilities change to responsibilities of the Data Management Team Head.

## 3.2  Management Team Components and Tasks

### 3.2.1  Science Team

All the Science Team members are also members of the Data Management Team.  As with Roy Spencer, the AMSR-E Science Team members' responsibilities change after Aqua launch.  The responsibilities of the Data Management Team are:

    a)  Verify the science data quality
    b)  Verify the quality of the products processed with their algorithms; update the algorithms when necessary
    c)  Validate their algorithms
    d)  Be available for data anomalies resolution; this task lasts for at least 5 years after launch

### 3.2.2  Team Leader Science Computing Facility (TLSCF)

Dawn Conway of the University of Alabama in Huntsville (UAH) is the TLSCF lead software engineer and is supported by Don Moss, also of UAH.  Ms. Conway oversees the AMSR-E science software integration and test (SSI&T) at the TLSCF, interfaces with GHCC-SIPS and NSIDC, the science team, and ECS to ensure all requirements and software standards are met.  She is also responsible for AMSR-E software documentation, reviewing and editing AMSR-E EOSDIS guide documents (user's guides prepared by NSIDC), defining AMSR-E metadata elements, and coordinating the ESDT development and AMSR-E specific applications with ECS.  Mr. Moss readies the software for operational integration and testing at the GHCC-SIPS, reviews and enhances the browse software, and writes the metadata subroutines.

### 3.2.3  Science Investigator-led Processing System (SIPS)

Dr. Spencer is the AMSR-E SIPS Principal Investigator and Michael Goodman/NASA-GHCC is the Project Manager of the AMSR-E SIPS.  The manager is responsible for the implementation, integration of processing and system software and the daily operations of the SIPS.  The SIPS is tasked to produce AMSR-E standard data products.  The SIPS is primarily composed of two organizations: (1) Remote Sensing Systems (RSS) in Santa Rosa, California and (2) Global Hydrology and Climate Center (GHCC) in Huntsville, Alabama.  Frank Wentz manages the RSS component of the SIPS.  RSS is responsible for the generation of Level 2A AMSR-E brightness temperature data set and their delivery to the GHCC.  The GHCC is responsible for the processing and generation of the AMSR-E Level 2B and Level 3 standard products, and the subsequent distribution of all Level 2 and Level 3 products to the NSIDC DAAC.

## 3.2.4  National Snow and Ice Data Center (NSIDC)

The National Snow and Ice Data Center (NSIDC) Distributed Active Archive Center (DAAC) provides data and related services for polar and cryospheric research and education. NSIDC DAAC data sets are a source of information about cryospheric and polar processes. After the launch of EOS Aqua, the NSIDC DAAC will ingest AMSR-E Level 0 Science and Ground Based Attitude Determination (GBAD) products, Level 1A, Level 2 and Level 3 products. The NSIDC DAAC archives these products in the Earth Observing System Data Information System (EOSDIS) Core System (ECS Release Drop 6A) and distribute them in accordance with NASA's EOS Data and Information Policy (1999 EOS Reference Handbook). A high-level architecture for the ECS Release 6A is depicted in Figure 3.1
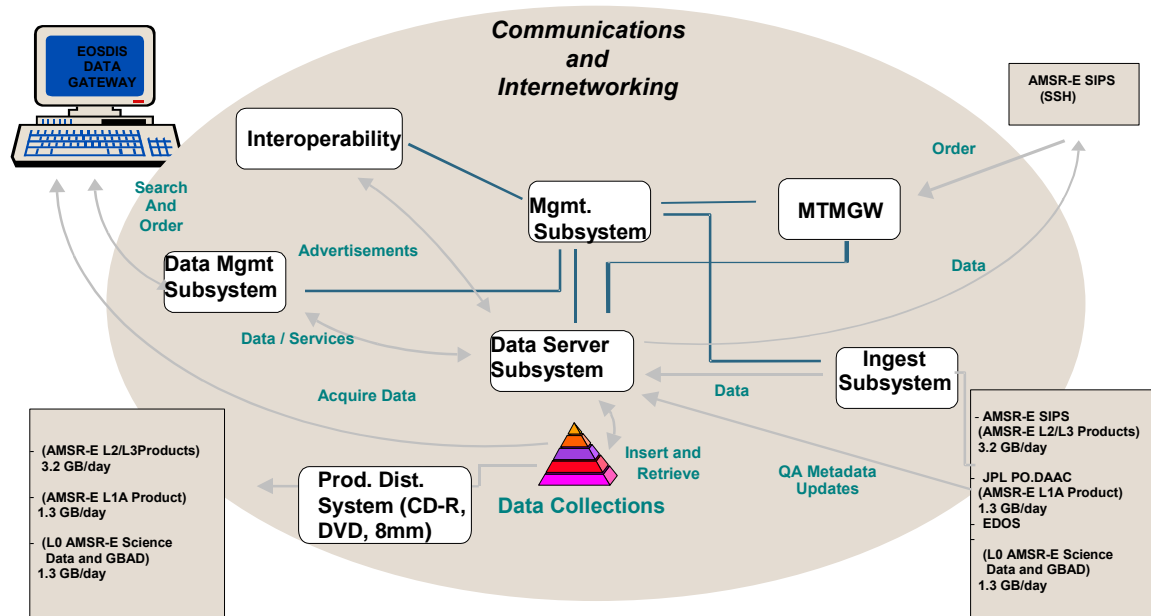


Figure 3.1. High-level architecture for the ECS Release 6A

# 4   SCIENCE MISSION OVERVIEW

The AMSR-E is similar to the SSM/I in conceptual design, with an offset parabolic reflector and radiometer drum assembly rotating about a vertical axis, conically scanning across the Earth.  From the 705 km altitude orbit of the Aqua Platform, the AMSR-E 47.4$^o$ view angle results in an Earth incidence angle of 55.0$^o$, and its +/- 61$^o$ active scan angle provides a data swath width of 1445 km.  Once during each scan a cold sky subreflector occults the feedhorn array's view of the Earth to provide cold calibration measurements from the cosmic background.  Similarly, a warm calibration target also occults the feedhorns to provide warm calibration measurements from a temperature-controlled high-emissivity target.  Other characteristics of the AMSR-E sampling are contained in Table 4.1.  Also listed are the spatial resolutions attained at each frequency from the 705 km orbital altitude of the Aqua Platform.

**Table 4.1.  AMSR-E characteristics from the 705 km orbital altitude of the Aqua Platform.**

| Center Frequencies (GHz) | 6.925 | 10.65 | 18.7 | 23.8 | 36.5 | 89.0 |
|---|---|---|---|---|---|---|
| Bandwidth (MHz) | 350 | 100 | 200 | 400 | 1000 | 3000 |
| Sensitivity (K) | 0.3 | 0.6 | 0.6 | 0.6 | 0.6 | 1.1 |
| Instantaneous FOV (Km x km) | 75x43 | 48x27 | 27x16 | 31x18 | 14x8 | 6x4 |
| Sampling Interval (Km x km) | 10x10 | 10x10 | 10x10 | 10x10 | 10x10 | 5x5 |
| Integration Time (msec) | 2.6 | 2.6 | 2.6 | 2.6 | 2.6 | 1.3 |
| Main Beam Efficiency (%) | 95.3 | 95.0 | 96.3 | 96.4 | 95.3 | 96.0 |
| Beamwidth (half-power, degrees) | 2.2 | 1.4 | 0.8 | 0.9 | 0.4 | 0.18 |

The AMSR-E products follow the heritage of the SMMR and SSM/I instruments and their products.  In many cases the algorithms are expected to provide improved products owing to more available channels, higher spatial resolution, and more stable calibration.

NASDA, as the instrument provider, will process the Level 0 data into Level 1, and provide it to the AMSR-E SIPS via PO.DAAC.  RSS-SIPS will ingest the Level 1 data and after processing them into Level 2A, will provide them to GHCC-SIPS (more details in the next section).

Table 4.2 summarizes the Level 2 (swath) products that will be routinely generated.  The newer capabilities in Table 4.2 are SST and surface soil moisture.  The SST capability of passive microwave observations at 10.7 GHz has been recently demonstrated by F. Wentz with TRMM Microwave Imager (TMI) data.  AMSR-E will allow SST retrievals to be done separately at 6.9 GHz and 10.65 GHz.  The soil moisture retrievals are built upon the SMMR experience, as well as field experiments utilizing airborne microwave radiometers.

Level 3 (space- and/or time-averaged) products are listed in Table 4.3.  Note the addition of sea ice parameters and snow cover parameters, which have no Level 2 counterparts.  Also note the newer product, sea ice is now possible with the 6.9 GHz channels of AMSR-E.

Validation of the standard products will involve a combination of aircraft measurements during field experiments, comparisons to other spaceborne microwave radiometer products (from SSM/I, TMI, SSMIS, AVHRR), radar, in-situ data from buoys, radiosondes, etc.  These validation activities are being coordinated with NASDA through the Joint AMSR Science Team.  (See Appendix I for the members of the Joint AMSR Science Team)

In addition to the standard products, several of the Team investigators will be producing and evaluating "research" products.  These products could form the basis for future standard products.  Table 4.4 lists these research products.

**Table 4.2.  Standard Level 2 (swath) products from AMSR-E.**

| PARAMETER | TARGET ACCURACY | SPATIAL RESOLUTION | INVESTIGATORS |
|---|---|---|---|
| Brightness Temperature (Tb) | $0.2^{\circ} - 0.7^{\circ}$ C | 5-56 km | NASDA (Level 1A); F. Wentz (RSS, Level 2A) |
| Oceanic surface wind speed | 1.0m/s | 38 and 21 km | F. Wentz (RSS) |
| Oceanic integrated water vapor | 1.0 mm 0.1 g/cm$^2$ | 21 km | F. Wentz (RSS) |
| Oceanic cloud liquid water | 0.02 mm or 2 mg/cm$^2$ | 12 km | F. Wentz (RSS) |
| Sea Surface Temperature (SST) | $0.5^{\circ}$ C | 56 and 38 km | F. Wentz (RSS) |
| Surface soil moisture | 0.06 g/cm$^3$ (low vegetation) | 56 km | E. Njoku (JPL) |
| Global Rainfall | Ocean: 1 mm/hr or 20%, whichever is greater Land: 2 mm/hr or 40%, whichever is greater | 10 km | C. Kummerow (CSU) R. Ferraro (NOAA/NESDIS) |
| Rain Type (convection fraction) | N/A | 10 km | C. Kummerow (CSU) |

**Table 4.3.  Standard Level 3 (gridded) products from AMSR-E.**

| PARAMETER | TARGET ACCURACY | GRID SPACING* | INVESTIGATORS |
|---|---|---|---|
| 89 GHz Tb (daily, daily asc., daily desc.) | | 6.25 km | D. Cavalieri (GSFC) J. Comiso (GSFC) |
| 18.7, 23.8, 36.5, and 89 GHz Tb (daily, daily asc., daily desc.) | | 12.5 km | D. Cavalieri (GSFC) J. Comiso (GSFC) |
| 6.925, 18.7, 23.8, 36.5, and 89 GHz Tb (daily, daily asc., daily desc.) | | 25 km | D. Cavalieri (GSFC) J. Comiso (GSFC) |
| Oceanic surface wind speed (daily, weekly, monthly) | 0.9 m/s (daily) | $0.25^{\circ}$ x $0.25^{\circ}$ grid | F. Wentz (RSS) |
| Oceanic integrated water vapor (daily, weekly, monthly) | 0.2 g/cm$^2$ | $0.25^{\circ}$ x $0.25^{\circ}$ grid | F. Wentz (RSS) |
| Oceanic cloud liquid water (daily, weekly, monthly) | 3 mg/cm$^2$ | $0.25^{\circ}$ x $0.25^{\circ}$ grid | F. Wentz (RSS) |
| Sea Surface Temperature (SST) (daily, weekly, monthly) | $0.5^{\circ}$ C | $0.25^{\circ}$ x $0.25^{\circ}$ grid | F. Wentz (RSS) |
| Surface soil moisture (daily asc., daily desc.) | 0.06 g/cm$^3$ (low vegetation) | 25 km (Global EASE grid) | E. Njoku (JPL) |
| Global Rainfall (monthly) | Ocean: 10% Land: 20% | $5^{\circ}$ x $5^{\circ}$ grid | T. Wilheit (TAMU) |
| Snow water equivalent, desc. only (daily, 5-day, monthly) | 10 mm or 20% | 25 km (EASE grid) | A. Chang (GSFC) |
| Sea Ice Concentration (daily, daily asc., daily desc.) | < 5% | 6.25, 12.5, 25 km (polar stereographic grid) | D. Cavalieri (GSFC) J. Comiso (GSFC) |
| Snow Depth over sea ice (5-day) | < 5 cm | 12.5 km (polar stereographic grid) | D. Cavalieri (GSFC) J. Comiso (GSFC) |

| Sea Ice Temperature (daily, daily asc., daily desc.) | < 4 ° C | 25 km (polar stereographic grid) | D. Cavalieri (GSFC) J. Comiso (GSFC) |

\* The grid spacing is different from the inherent spatial resolution of the observations

Table 4.4.  AMSR-E Research products

| AMSR-E group | Product | Contact point |
|---|---|---|
| Sea Ice | Ice Type | J. Comiso |
| Snow | Snow depth | A. Chang |
| Soil Moisture | Surface type, vegetation water content and, surface temperature | E. Njoku |
| Precipitation | Monthly rainfall from the accumulated L2 product | T. Wilheit |

# 5   Data Products

## 5.1   Science data flow

The Level 1A AMSR-E antenna temperatures generated by NASDA will be ingested by RSS-SIPS via the Jet Propulsion Laboratory's Physical Oceanography DAAC (PO.DAAC).  The AMSR-E Level 1A granule is defined as one-half of one orbit, the division being at the poles, so that a granule is descending (North Pole to South Pole) or ascending (South Pole to North Pole).  There are approximately 28 Level 1A granules per day.  The JPL PO.DAAC will serve as a routing center (Level 1A data will also be stored for 90 days) for the AMSR-E data as they are sent from Japan to the United States.  The JPL PO.DAAC is being utilized as the routing center due to its previously defined role as the data processing center for AMSR (AMSR-E's sister instrument) on the ADEOS-II satellite manifest.

RSS-SIPS will generate the Level 2A brightness temperatures from the NASDA Level 1A data set.  The Level 2A data set will consist of half-orbit files produced on a continuous basis, as each Level 1A half-orbit file is ingested.  Upon generation of each half-orbit Level 2A product, the files will be sent to the AMSR-E SIPS facility at the GHCC for higher order processing (see Section 6.0).

The science data flow is illustrated in figure 5.1.

## 5.2   Requirements and Sources for Input Data and Algorithms

This section discusses the content and format of the AMSR-E EOS Level 2A, Level 2B, and Level 3 standard products, metadata files, and browse files with a short overview of the AMSR-E Level 1A product.

### 5.2.1   AMSR-E Data

Each AMSR-E Level 2A, Level 2B, and Level 3 standard product has a defined Earth Science Data Type (ESDT) within the ECS system.  An ESDT must be defined for every data collection managed by the ECS. The ESDT defines collection level metadata, granule level metadata, and the services that can be performed on granules in the collection.  A granule is the smallest amount of data processed in a file. Collection level metadata defines the characteristics of the data collection to which a granule belongs. Granule level metadata defines the characteristics that are unique to that granule. Services define what ECS can do with the granule. Standard services include Insert (inserting the granule into the Data Server) and Acquire (getting the granule back from the Data Server).  The AMSR-E SCF is responsible for defining and updating the AMSR-E Level 2A, Level 2B, and Level 3 ESDTs.  The ECS is responsible for the implementation and configuration management of these ESDTs.

Each AMSR-E standard product is in the HDF-EOS format and contains granule level metadata of two types, structural and inventory.  The structural metadata are written by HDF-EOS and describe the file structure.  The inventory metadata are compliant with the ECS B.0 model and mandatory attributes are stored in the PVL format as an HDF-EOS global attribute.  The inventory metadata are also supplied to the ECS system in an independent .met file.

The ESDT, metadata, science source code, scripts, and ancillary files for each AMSR-E Level 2A, Level 2B, and Level 3 standard product are discussed in detail in the following sections.  Table 5.2 lists the AMSR-E Level 2A, Level 2B, and Level 3 standard products by ESDT short name, ESDT long name, and affiliated science team members.
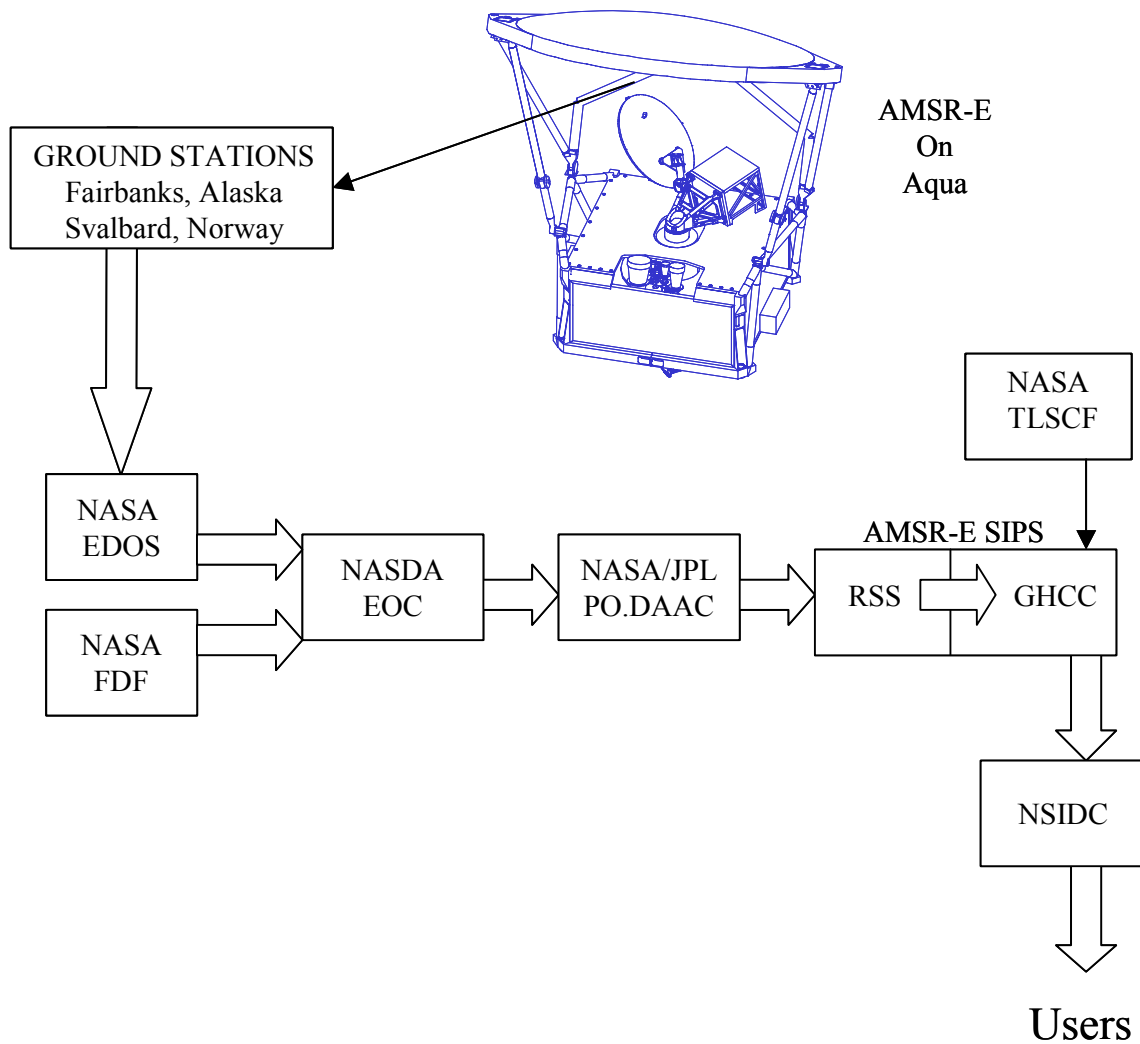
Figure 5.1. Science data flow from Aqua to the users

## 5.2.1.1 Level 1A Data

The AMSR-E Level 1A granule is defined as one-half of one orbit, the division being at the poles, so that a granule is descending (North Pole to South Pole) or ascending (South Pole to North Pole). The granule contains chronological antenna temperature count data accompanied by related ancillary data. The AMSR-E scan time is 1.5 seconds and the Aqua orbit period is 100 minutes, resulting in approximately 2000 data scans per granule. The approximate size of the Level 1A granule is 42 MB.

Table 5.2 AMSR-E ESDT short names, long names, and affiliated science team member

| Short Name | Long Name | Science Team Member |
|---|---|---|
| AE_L2A | AMSR-E/Aqua L2A Global Swath Spatially-Resampled Brightness Temperatures | Frank Wentz Peter Ashcroft |
| AE_Ocean | AMSR-E/ Aqua L2B Global Swath Ocean Products derived from Wentz Algorithm | Frank Wentz |
| AE_Land | AMSR-E/ Aqua L2B Surface Soil Moisture, Ancillary Parms, & QC EASE_Grids | Eni Njoku |
| AE_Rain | AMSR-E/ Aqua L2B Global Swath Rain Rate/Type GPROF algorithm | Robert Adler Ralph Ferraro Chris Kummerow |
| AE_RnGd | AMSR-E/ Aqua Monthly L3 5x5 deg Rainfall Accumulations | Thomas Wilheit |
| AE_DyOcn | AMSR-E/Aqua Daily L3 Global Ascending/Descending .25x.25 deg Ocean Grids | Frank Wentz |
| AE_WkOcn | AMSR-E/Aqua Weekly L3 Global Ascending/Descending .25x.25 deg Ocean Grids | Frank Wentz |
| AE_MoOcn | AMSR-E/Aqua Monthly L3 Global Ascending/Descending .25x.25 deg Ocean Grids | Frank Wentz |
| AE_DySno | AMSR-E/Aqua Daily L3 Global Snow Water Equivalent EASE-Grids | Alfred T.C. Chang |
| AE_5DSno | AMSR-E/Aqua 5-Day L3 Global Snow Water Equivalent EASE-Grids | Alfred T.C. Chang |
| AE_MoSno | AMSR-E/Aqua Monthly L3 Global Snow Water Equivalent EASE-Grids | Alfred T.C. Chang |
| AE_SI6 | AMSR-E/Aqua Daily L3 6.25 km 89 GHz Brightness Temperature (Tb) Polar Grids | Donald Cavalieri Josefino Comiso |
| AE_SI12 | AMSR-E/Aqua Daily L3 12.5 km Tb, Sea Ice Conc., & Snow Depth Polar Grids | Donald Cavalieri Josefino Comiso |
| AE_SI25 | AMSR-E/Aqua Daily L3 25 km Tb, Sea Ice Temperature, & Sea Ice Conc. Polar Grids | Donald Cavalieri Josefino Comiso |
| AE_Land3 | AMSR-E/Aqua Daily L3 Surface Soil Moisture, Interpretive Parms, & QC EASE-Grids | Eni Njoku |

The AMSR-E Level 1A granule is stored in the Hierarchical Data Format (HDF). Each granule consists of core metadata, product metadata, and science data. The core metadata are compliant with the ECS B.0 mandatory attributes and are stored as global attributes. The core metadata contain such things as the data set short name, the product generation executable name, associated version numbers, input file names, beginning and ending times of the granule, processing center, contact information, and quality assurance flags. The product metadata are also stored as HDF global attributes and include satellite orbit parameters, instrument scan geometry, thermistor conversion tables, and antenna pattern coefficients. The Level 1A is a calibrated data set and it includes time, latitude, longitude, antenna temperature counts, slopes and offsets for calculating $T_{AS}$, various calibration temperature counts, land/ocean flags, and navigation information. This data set has also been corrected for cross-pol and sidelobe errors.

The AMSR-E Level 1A data are generated at NASDA Earth Observations Center (EOC) in Hatoyama, Japan. These data are automatically transferred to the JPL PO.DAAC. The data are then forwarded to SIPS-RSS for Level 2A processing. For details, see the Operations Agreement Between the PO.DAAC and the AMSR-E SIPS- RSS.

## 5.2.1.2  Level 2A Data

The AMSR-E Level 2A granule definition is one half-orbit. The Level 2A granule contains resampled Brightness Temperatures (TBs). The only processing done between Level 1A and 2A is resampling; QA and land/ocean flags are added to help in the product processing that follows. The Level 2A resampled TBs and associated data are stored using the HDF-EOS swath interface. The data are divided into 3 swaths: a low resolution swath, a high resolution A-scan swath, and a high resolution B-scan swath. Each swath has the associated geolocation fields of time, latitude, and longitude. The contents of each scan are described in Appendix II, Table 1. A list of the inventory level metadata items is given in Table 5.3a and 5.3b, respectively. Level 2A granules are made up of approximately 2000 scans (this variable number of scans will be called NS, Number of Scans).

Additional parameters are written as global HDF-EOS swath attributes. These are items extracted from the AMSR-E Level 1A granule that may be of interest to the user, but are not necessarily needed by the ECS system to perform data archival, search, or retrieval. The items include start orbit number, stop orbit number, longitude of ascending node, ascending node date, ascending node time, orbit direction, number of scans, orbit semi major axis, orbit eccentricity, orbit argument of perigee, orbit inclination, orbit period, ellipsoid names, semi major axis of earth, flattening ratio of earth, and telemetry conversion tables.

The ancillary files used in processing Level 2A data are listed in Appendix II, Table 2.

Table 5.3a AMSR-E Level 2A, 2B inventory metadata

| Name | Description |
|---|---|
| LocalGranuleID | Filename |
| ProductionDateTime | Date and time of granule production |
| AutomaticQualityFlag | Automated QA indicator of granule |
| AutomaticQualityFlagExplanation | Definition of the usage of automatic QA flag |
| OperationalQualityFlag | Processing diagnostics |
| OperationalQualityFlagExplanation | Definition of the usage of the operational QA flag |
| ScienceQualityFlag | Science data content |
| ScienceQualityFlagExplanation | Definition of the usage of the science QA flag |
| QAPercentMissingData | Percent missing data in the granule |
| QAPercentOutofBoundsData | Percent out-of-bounds data in the granule |
| OrbitModelName | Orbit model used to calculate satellite position vectors |
| StartOrbitNumber | Start orbit number of granule |
| StopOrbitNumber | Stop orbit number of granule |
| EquatorCrossingLongitude | The descending equator crossing longitude of the granule |
| EquatorCrossingTime | Time of the equator crossing: hh:;mm:ss.sssZ |
| EquatorCrossingDate | YYYY-MM-DD |
| Short Name | ECS ESDT short name associated with this granule |
| InputPointer | Input file name |
| Version ID | ESDT VersionID |
| GringPointLatitude | An array of latitudes and longitudes that define the polygon |
| GringPointLongitudes | outlining the granule data swath |
| GringPoint SequenceNo | An array of digits defining the sequence of the latitudes and longitudes used to define the polygon |
| RangeBeginningDate | YYYY-MM-DD |
| RangeBeginningTime | Hh:mm:ss.sssZ |
| RangeEndingDate | YYYY-MM-DD |

| RangeEndingTime | Hh:mm:ss.sssZ |
|---|---|
| PGEVersion | Product Generation Executable Version |
| NominalPassIndex (AMSR-E PSA) | The nominal pass index number for the pass that best describes the spatial location of the granule, where the pass is either the ascending of descending portion of an orbit. |
| StartPolygonNumber (AMSR-E PSA) | The index number for the first polygon associated with the nominal pass number in the granule. |
| StopPolygonNumber (AMSR-E PSA) | The index number for the last polygon associated with the nominal pass number in the granule. |
| Ascending/Descending flag | Indicates if data in the granule were collected during an ascending or descending pass |
| Measured Parameter | Description of parameter(s) stored in the file |

Table 5.3b  AMSR-E Level 3 inventory metadata

| Name | Description |
|---|---|
| LocalGranuleID | Filename |
| ProductionDateTime | Date and time of granule production |
| AutomaticQualityFlag | Automated QA indicator of granule |
| AutomaticQualityFlagExplanation | Definition of the usage of automatic QA flag |
| OperationalQualityFlag | Processing diagnostics |
| OperationalQualityFlagExplanation | Definition of the usage of the operational QA flag |
| ScienceQualityFlag | Science data content |
| ScienceQualityFlagExplanation | Definition of the usage of the science QA flag |
| QAPercentMissingData | Percent missing data in the granule |
| QAPercentOutofBoundsData | Percent out-of-bounds data in the granule |
| Short Name | ECS ESDT short name associated with this granule |
| InputPointer | Input file name |
| Version ID | ESDT VersionID |
| WestBoundingCoordinate | Western point of spatial domain bounding box |
| NorthBoundingCoordinate | Northern point of spatial domain bounding box |
| EastBoundingCoordinate | Eastern point of spatial domain bounding box |
| SouthBoundingCoordinate | Southern point of spatial domain bounding box |
| RangeBeginningDate | YYYY-MM-DD |
| RangeBeginningTime | Hh:mm:ss.sssZ |
| RangeEndingDate | YYYY-MM-DD |
| RangeEndingTime | Hh:mm:ss.sssZ |
| PGEVersion | Product Generation Executable Version |
| Measured Parameter | Description of parameter(s) stored in the file |

## 5.2.1.3  Level 2B and Level 3

Level 2B Ocean Products

Each AMSR-E Level 2B ocean products granule includes Sea Surface Temperature (SST), wind speed over ocean, water vapor over ocean, and cloud liquid water over ocean measurements, as well as geolocation fields of time, latitude and longitude.  Each AMSR-E Level 2B granule is stored in HDF-EOS using the swath interface.  The AMSR-E level 2B ocean products granule contents are described in Appendix II, Table 3.  The inventory level metadata for the AMSR-E Level 2B ocean products are listed in Table 5.3a, above.

The ancillary files used in processing the standard ocean products are listed in Appendix II, Table 4.

Level 2B Surface Soil Moisture Product

Each AMSR-E Level 2B surface soil moisture granule consists of surface soil moisture measurements and a number of ancillary derived quality-control parameters including surface type, vegetation water content, surface temperature. These data are re-mapped to a 25-km EASE grid.  Each granule is stored in HDF-EOS using the point interface.

The Level 2B surface soil moisture granule includes two geolocation fields, "Latitude" and, "Longitude".  "Time" is not included as a geolocation field because the time array is sequenced spatially, not chronologically, after gridding.  The physical file format is described in Appendix II, Table 5.  The inventory level metadata for the AMSR-E Level 2B surface soil moisture are listed in Table 5.3a.

The ancillary files used in the processing the standard surface soil moisture product are listed in Appendix II, Table 6.  .

Level 2B Rainfall Products

Each AMSR-E Level 2B rainfall granule includes global rain rate and type, and the geolocation fields: time, latitude, and longitude.  Each granule is stored in HDF-EOS using the swath interface.   The Level 2B rainfall products granule contents are described in Appendix II, Table 7.   The inventory metadata for the Level 2B Rainfall products are listed in Table 5.3a. A number of ancillary files are used in the processing the standard rainfall products.  A description of these files is given in Appendix II, Table 8.

Level 3 Ocean Products

The AMSR-E Level 3 ocean products are daily, weekly and monthly ascending/descending 0.25 x 0.25 grids of the six Level 2B ocean products.  The six products are sea surface temperature at 56 km and 38 km resolution, ocean wind speed at 38 km and 24 km resolution, water vapor over ocean at 24 km resolution and cloud liquid water at 12 km resolution.  The AMSR-E Level 3 ocean granules are stored in HDF-EOS using the grid interface and the US Geological Survey General Coordinate Transformation Package (GCTP)-Geographic projection.

The Level 3 daily ocean products granule contents are described in Appendix II, Table 9.  The Level 3 weekly and monthly products are identical in format to the daily product.  The inventory level metadata for the AMSR-E Level 3 ocean products are listed in Table 5.3b.

No ancillary files are used in the creation of the Level 3 Ocean Products.

Level 3 Snow Product

The AMSR-E Level 3 snow products are daily, 5-day, and monthly Lambert Azimuthal Equal Area grids on descending (am) passes only.  The snow products are snow water equivalent, gridded separately for the Northern and Southern Hemispheres.  Snow depth is a research product (did not go through the ATBD process).  The AMSR-E Level 3 snow granules are stored in HDF-EOS using the grid interface.

The Level 3 daily snow products granule contents are described in Appendix II, Table 10.  The formats for the 5-day, and monthly products are identical to the daily product format.  The inventory level metadata for the AMSR-E Level 3 snow products are listed in Table 5.3b.

A number of ancillary files are used in the processing of the standard snow product. These files are listed in Appendix II, Table 11.

Level 3 Sea Ice Products

The AMSR-E Level 3 sea ice products are polar stereographic grids at three spatial resolutions: 6.25 km, 12.5 km, and 25 km.   The 6.25 km products are 89.0 GHz TBs.  The 12.5 km products are sea

ice concentration, snow depth over ice, and TBs for the 18.7, 23.8, 36.5, and 89.0 GHz channels. The 25.0 km products are sea ice concentration, sea ice temperature, and TBs for the 6.925, 10.65, 18.7, 23.8, 36.5, and 89.0 GHz channels. The AMSR-E Level 3 sea ice granules are stored in HDF-EOS using the grid interface.

The Level 3 6.25 km, 12.5 km, and 25.0 km sea ice products granule contents are described in Appendix II, Table 12, 13, and 14, respectively. The structural metadata include the projection parameters. The inventory metadata for the AMSR-E Level 3 sea ice products are listed in Table 5.3b.

The ancillary files used in the sea ice standard products processing are listed in Appendix II, Table 15.

Level 3 Rainfall Products

The AMSR-E Level 3 rain products are processed on 2 separate grids of monthly rainfall accumulation: one over ocean and one over land. The grids are 5 degree by 5 degree, created using the HDF-EOS grid interface and the GCTP-Geographic projection. The data over land uses the Level 2B land rainfall products derived with the Goddard Profiling (GPROF) algorithm as input. The Texas A&M University (TAMU) processes ocean rainfall and uses the Level 2A TBs as input. The format of the AMSR-E Level 3 rain products is described in Appendix II, Table 16.

The structural metadata include the projection parameters. The inventory metadata for the AMSR-E Level 3 rainfall products are listed in Table 5.3b.

The ancillary files used in processing of the Level 3 rainfall products are listed in Appendix II, Table 17.

Level 3 Surface Soil Moisture Product

Each AMSR-E Level 3 EASE-grid surface soil moisture granule consists of daily global 25-km EASE-grids of brightness temperatures, surface soil moisture, and other ancillary derived quality-control parameters including vegetation water content, and surface temperature. Each granule is stored in HDF-EOS using the grid interface and the GCTP-Behrmann Cylindrical Equal-Area projection (25 km EASE-grids, true at 30 degrees north or south).

The Level 3 surface soil moisture product contents are described in Appendix II, Table 18. The inventory level metadata for the AMSR-E Level 3 surface soil moisture are listed in Table 5.3b.

No additional ancillary files are used in the processing of the Level 3 surface soil moisture product.

## 5.2.2  Auxiliary AMSR-E Products

## 5.2.2.1  Browse Products

The initial browse products will be generated by the SIPS-GHCC. Integration and test of the browse software, as well as the configuration management of the software, will be performed in the same manner as the science software. These products, in HDF Raster format, along with metadata identifying the browse/data relationship will be sent to NSIDC for archiving, via the SIPS PDRS interface. The browse will also be available on the web as .png files at http://wwwghcc.msfc.nasa.gov/AMSR .

## 5.2.2.2  Quality Assessment Products

Quality assessment will be performed on each AMSR-E product. For a description of the quality assessment procedures, please see the AMSR-E QA Plan. Quality assessment summaries will be available for each granule at http://wwwghcc.msfc.nasa.gov/AMSR. These products will be sent to NSIDC for

archiving, via the SIPS PDRS interface. Additionally, the TLSCF plans to provide inter-granule QA summaries whose contents are TBD.

## 5.2.3  Science Software

## 5.2.3.1  Introduction

There are three components of each AMSR-E science software Product Generation Executable (PGE): science software, metadata, and QA routines. The science software and output routine for each AMSR-E EOS Level 2A, Level 2B, and Level 3 standard product is produced by the AMSR-E EOS science team member affiliated with the product. The QA routine and the granule level metadata generation routines are created and maintained by the TLSCF. The software is then integrated and tested by the TLSCF software team, with input from the science team members as needed. Upon completion of integration and test, the software, all required ancillary files, and software release documentation are delivered to the SIPS-GHCC (Level 2B and Level 3). The SIPS-GHCC is responsible for configuration management of all source code, scripts, ancillary files, and release documentation used for production.

## 5.2.3.2  File Naming Conventions

The AMSR-E Level 2A, Level 2B, and Level 3 file naming conventions are given in Table 5.4. The conventions are compliant with ECS requirements.

Table 5.4.  AMSR-E Level 2 and Level 3 file naming conventions

| AMSR-E Short Name | File Naming Convention |
|---|---|
| AE_L2A | AMSR_E_L2A_BrightnessTemperatures_X##_yyyymmddhhmm.hdf |
| AE_Ocean | AMSR_E_L2_Ocean_X##_yyyymmddhhmm.hdf |
| AE_Land | AMSR_E_L2_Land_X##_yyyymmddhhmm.hdf |
| AE_Rain | AMSR_E_L2_Rain_X##_yyyymmddhhmm.hdf |
| AE_RnGd | AMSR_E_L3_RainGrid_X##_yyyymmddhhmm.hdf |
| AE_DyOcn | AMSR_E_L3_DailyOcean_X##_yyyymmddhhmm.hdf |
| AE_WkOcn | AMSR_E_L3_WeeklyOcean_X##_yyyymmddhhmm.hdf |
| AE_MoOcn | AMSR_E_L3_MonthlyOcean_X##_yyyymmddhhmm.hdf |
| AE_DySno | AMSR_E_L3_DailySnow_X##_yyyymmddhhmm.hdf |
| AE_5DSno | AMSR_E_L3_5DaySnow_X##_yyyymmddhhmm.hdf |
| AE_MoSno | AMSR_E_L3_MonthlySnow_X##_yyyymmddhhmm.hdf |
| AE_SI6 | AMSR_E_L3_SeaIce6km_X##_yyyymmddhhmm.hdf |
| AE_SI12 | AMSR_E_L3_SeaIce12km_X##_yyyymmddhhmm.hdf |
| AE_SI25 | AMSR_E_L3_SeaIce25km_X##_yyyymmddhhmm.hdf |
| AE_Land3 | AMSR_E_L3_DailyLand_X##_yyyymmddhhmm.hdf |

where yyyy indicates  year, mm month, dd day, hh hour, mm minutes, X is the product maturity indicator, and ## is the version number. All times are associated with the first scan of the granule.

Product Maturity Indicator

The AMSR-E standard product file names contain a product maturity indicator. The valid values for the standard product maturity indicator are "B", and "V" for beta, and validated, respectively. 'Beta' product maturity indicates use of NASDA calibrated data in producing the Level 2A TBs; the product

maturity will graduate to 'validated' once the science software has been tested and the algorithm validated using the official NASA calibration.

One final value for the product maturity code is "P", preliminary. This is the maturity code that will be used to indicate non-standard near real time preliminary data products available at NSIDC through their Web based non-ECS system  These data are only available until the corresponding standard product is ingested at NSIDC.  NSIDC has the responsibility to remove the preliminary product once the standard product is available.  Currently, the TLSCF estimates a 5-8 day delay between preliminary products and standard products.  The delay is due to a number of processing factors and will be minimized as much as is possible by the SIPS.

Product Version Number

The AMSR-E standard product file names also contain a version number.  This version number will be updated any time a change is made to any component of the science software, or the product is reprocessed due to updates in input data.  The version number is updated by the TLSCF in the PGE, and delivered to the SIPS-GHCC as part of the science software for implementation.  At the same time, the TLSCF will also deliver a new DAP with the same version number.  This DAP delivery to the SIPS-GHCC will be sent on to NSIDC and ultimately to the user community. The user will always know which version of the science software was used to generate any product just by viewing the file name, and therefore which version of the DAP to request.

## 5.2.4  Input Data for Algorithms

The AMSR-E Level 2A data are generated at the SIPS-RSS and forwarded to the SIPS-GHCC, where QA is performed and the inventory level metadata is generated and attached.   The AMSR-E Level 2B and Level 3 products are generated at the SIPS-GHCC.  All of the Level 2B, the Level 3 Sea Ice, and the Level 3 Daily Snow products use the Level 2A TBs as input.  The Level 3 5-day and Monthly Snow products  use the Level 3 Daily Snow products as input.  The Level 3 ocean products and Level 3 land products use their respective Level 2B products as input.  The Level 3 Rainfall product uses both the Level 2A Tbs and the Level 2B Rainfall products as input.  The flow diagram in Figure 5.2 illustrates the AMSR-E product generation.
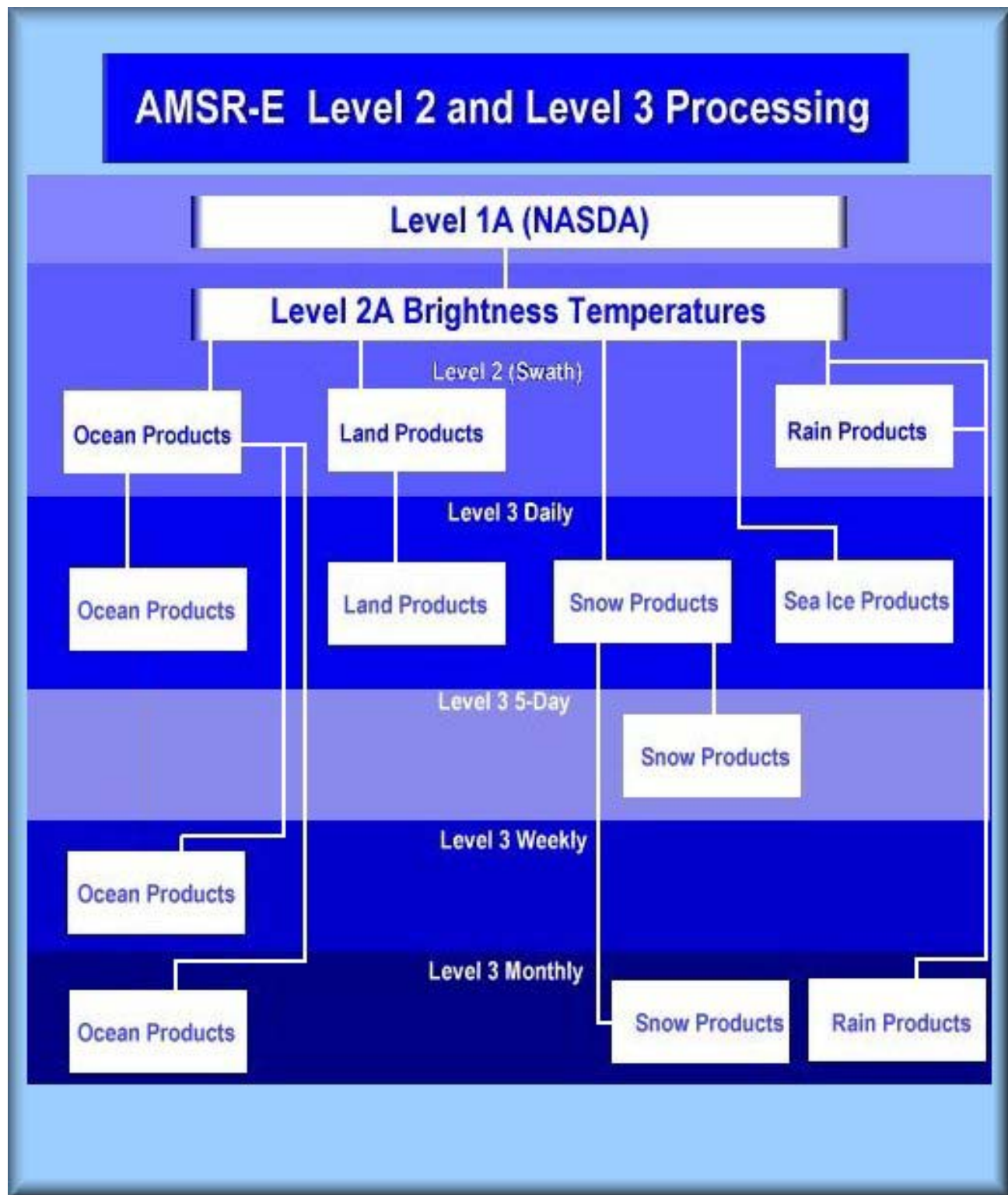
Figure 5.2  Flow diagram showing the AMSR-E product generation

# 6 Processing at SIPS

The AMSR-E SIPS is built on a distributed architecture, with processing occurring at both Remote Sensing Systems (RSS) in Santa Rosa, California and at the Global Hydrology & Climate Center (GHCC) in Huntsville, Alabama. "Eight by five" and on-call operations support will be provided by a core team of personnel, specializing in system administration, archive management, software development, and system engineering. As interfacing documents are developed and base-lined, the existing GHCC data management procedures will be modified and tailored for the SIPS operations.

## 6.1 Routine Operations

Under normal operating conditions, the SIPS-RSS receives Level 1A data from NASDA via the NASA Jet Propulsion Laboratory PO.DAAC, processes it the data into a Level 2A product, and transmits it the product via FTP to the SIPS-GHCC. (See Figure 6.1)

The SIPS-GHCC team processes the Level 2A data first into Level 2B swath products and then into Level 3 daily, 5-day, weekly and monthly gridded products. The Level 2A, Level 2B, and Level 3 products, associated metadata, production history, browse, QA files, and delivery algorithm packages (DAPs), are transferred to the National Snow and Ice Data Center (NSIDC) DAAC for archival and distribution to end users. Details of these routine operations are described in Interface Control Documents (ICDs) and Operations Agreements (OAs) between the interfacing data centers, as listed in Figure 6.2.
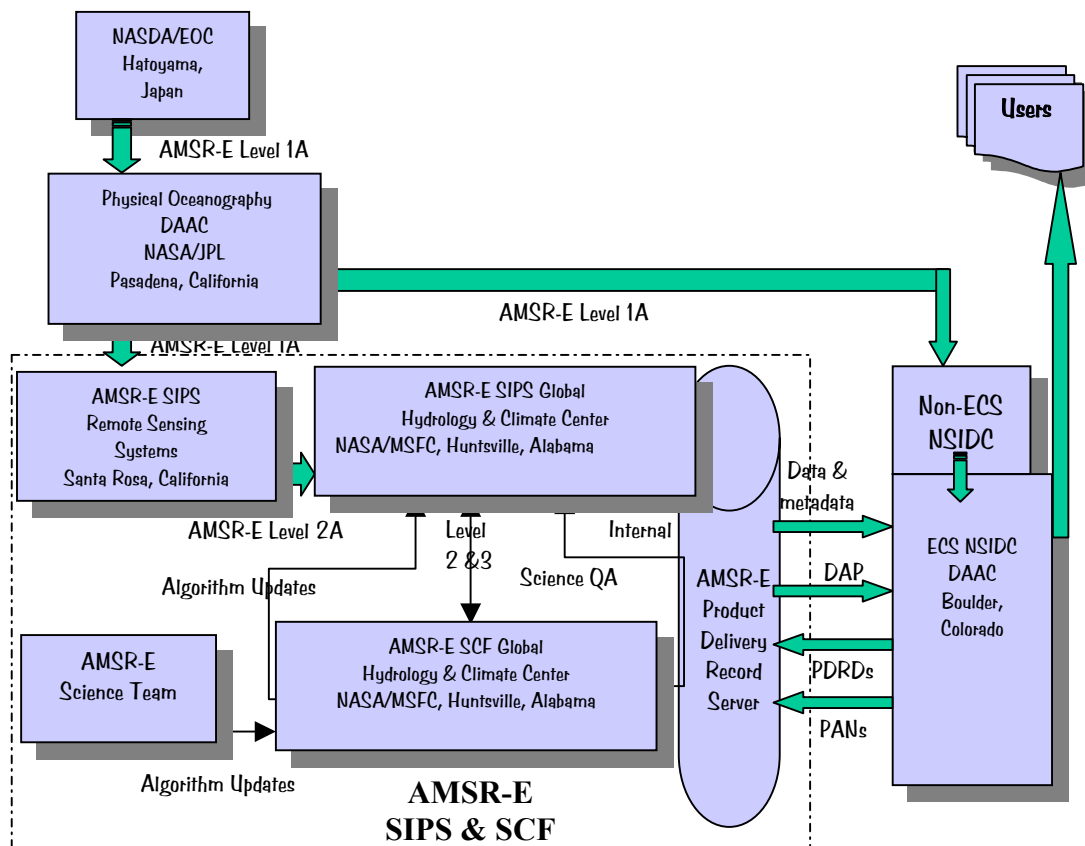


Figure 6.1. AMSR-E Processing and data flow.
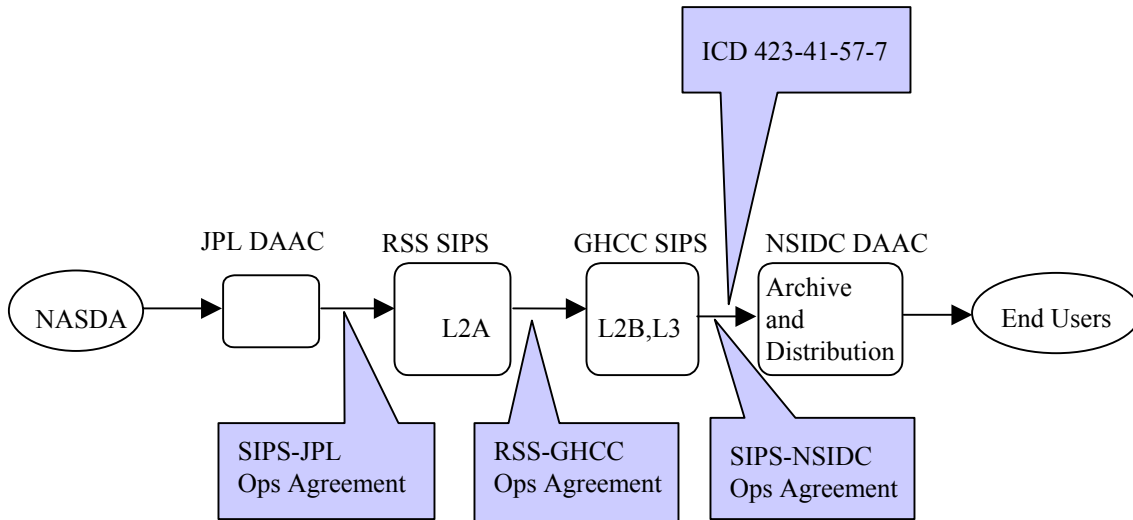
Figure 6.2.  ICDs and OAs between SIPS and interfacing data centers

All processing flows within the SIPS-GHCC are automated to run without operator intervention, under nominal conditions.  A processing "Master Script" coordinates the software execution, message logging, and handoff of each step in the processing stream from daily ingest of the Level 2A data from the SIPS-RSS through generation of all the standard products, metadata, and production histories; to staging data for science QA and distribution to the archive DAAC.  This Master Script is written in distinct modules to display meaningful log messages and exit gracefully if problems in the data or the processing system are detected.  A "Reprocessing" Master Script can be used to manually repeat any or all steps of the automated master script, in the event that errors are encountered anywhere in the processing flow.  The reprocessing script will also be used to regenerate the full suite of data products required by new versions of the processing algorithms.

## 6.1.1  Reprocessing

## 6.1.1.1  Routine Reprocessing

Updates to a science algorithm after the data are available to the users will necessitate reprocessing of that data product and any downstream products.  New versions of all affected products will be generated.  Current data products are generated in the new version as soon as the updated algorithm is integrated into the operational processing environment.  Previously processed data will be reprocessed beginning with earliest data and working forward.

## 6.1.1.2  Replacement of Erroneous Data

Infrequently, small amounts of data may need to be reprocessed due to improper processing, hardware failure, or human error.  In this case, erroneous data in the processing stream or archive will be replaced with the corrected data files.

## 6.2   Contingency Plans

### 6.2.1   Equipment Failures

All GHCC operational servers are covered by a vendor maintenance contract, which has typically provided Return To Service (RTS) support within 2-3 hours for soft failures and 24 hours for hard failures.  In the event of a hard failure where downtime is expected to exceed 24 hours, the SIPS will notify appropriate point-of-contact (POC), as listed in the operations agreements between data centers, describing the problem and the expected RTS time.

Electric power is supplied by a commercial power source and the operational server is connected to an Uninterruptible Power Supply (UPS).  The UPS supplying the primary GHCC operational hosts, including the SIPS-GHCC server, and their peripherals will last approximately one hour.  In the event a power outage is approaching the one-hour duration limit, UPS software will automatically shut down the primary hosts.  Once power is resumed, the UPS will automatically restart the hosts.

SIPS-RSS has a similar policy, as documented in the SIPS Configuration Management Plan.

### 6.2.2   Return-to-Service

After Return-to-Service, the SIPS will attempt to resume normal operations of near real time data ingest, processing, and distribution, while at the same time ingesting, processing, and distributing data that were missed, or not captured in near real time.

### 6.2.3   Inconsistent Data Flow

In the event that data are received out of time sequence, the SIPS policy will be to maintain the nominal real time processing and at the same time, process previously unprocessed data, starting with the oldest data and working forward in time until all unprocessed data are processed.

## 6.3   Availability

As described in Section 6.1, the Level 1A data orbit files will be routinely transferred from NASDA to JPL PO.DAAC and subsequently routed to RSS.  The JPL PO.DAAC does not process the data and will routinely redistribute the Level 1A data to RSS.  The JPL PO.DAAC will push the Level 1A data to RSS without invoking a specific hold period (using FastCopy).  Upon ingestion by RSS the Level 1A data will be processed into Level 2A data and pulled by GHCC, again without any specific hold period (using FastCopy).  As Level 2A data are ingested by GHCC from SIPS RSS, they will become available for the Level 2B and Level 3 processing software.  Level 2A, Level 2B and Level 3 data will be placed on the PDRS server for retrieval by the NSIDC DAAC.  The PDRS uses Product Delivery Record (PDR) notices to announce files available for transfer, and a corresponding Product Acceptance Notification (PAN) or Product Delivery Record Discrepancy (PDRD) notice to confirm successful or unsuccessful receipt of files.
The AMSR-E standard data products will also be placed in a password protected directory for pickup by the AMSR-E Science Team.  The Science Team has requested access to the products for science quality assessment.  Only trusted IP addresses will have access to the AMSR-E data and products through the SIPS-GHCC firewall.  All other private or public access to the data products must be obtained through the NSIDC DAAC.

## 6.4   Storage and Retention Requirements of Temporary Files

After the products are generated, they will be placed onto a short term holding area for Science team access. This holding area will be sized to keep 45 days of Level 2A, Level 2B and Level 3 daily products, and 6 months of weekly, 5-day products and Level 3 monthly products.  The SIPS-GHCC will use automated scripts to delete (age off) files older than the specified 45-days and 6-months.

## 6.5   Operational Quality Assessment

Operational Quality Assessment will be performed by the SIPS team as part of the ingest and production processing.  The ingest processing software will include a post-transfer comparison between the SIPS-RSS L2A source file and the file received at the SIPS-GHCC, done automatically by the ftp software package FastCopy.  Scripts used to write the L2A files to the storage device will use a read after write and compare routine to ensure that the archive process completed successfully.  Insertion of in-line science QA described earlier in this document will be accomplished during production processing, after which the products will be transferred to the archive DAAC using the ECS-required Product Delivery Record Server (PDRS).

## 6.6   Configuration Management of Algorithms

Configuration Management of science algorithms and automation scripts is the responsibility of the SIPS-GHCC.  After passing integration tests in the SCF SSI&T environment, working algorithms are migrated to the SIPS-GHCC integration and test environment.  The algorithms are then integrated with processing master scripts, executed, and verified to produce expected results according to SCF-provided test plans.  After these steps are successfully completed, the executables are installed, by the system administrators, into the SIPS-GHCC operational environment, the algorithm source code is entered into the UNIX-based Concurrent Versions System (CVS), and a Delivered Algorithm Package (DAP) is created and shipped to the archive DAAC, via the PDRS.  Each new version of every algorithm will go through these steps:  SSI&T, SIPS I&T, installation, source code CM, and DAP transferred to DAAC.  This procedure provides multiple levels of quality assurance and safeguards:  operational software is protected from unauthorized or unintended modification; previous versions of operational software may be checked out of the CVS library of algorithms; and simple traceability of change authorization.  Detailed information on configuration management issues is available in the SIPS CM Plan.

### 6.6.1   Science Algorithms Updating Guidelines

The algorithm developers are allowed to change the science software as often as necessary during the checkout phase.  The checkout phase consists of two parts:  the first year after launch, when unofficial calibrated data is being used, and a period of time following the release of the official calibration.  The process for implementing these changes is the same as the one used during the original implementation of the algorithms at the TLSCF.  The version numbers for all science software during the first part of the checkout period will remain constant at zero.  The version numbers will change as often as necessary during the second part of the checkout period. The product maturity indicator will accurately reflect the calibration source used during the second part of the checkout period.

At the end of the checkout period, the DAPs will be delivered to NSIDC and available to all users, along with standard data products designated as either Beta or Wentz, depending on the calibration source.

In the second year of data production, the science software will be updated quarterly if necessary. An exception to the quarterly updates will be made in the case of a critical change, one required to correctly process the data.  In this case, the software will be updated by the algorithm team, integrated and tested by the TLSCF, and implemented at the SIPS as soon as possible.  The version number of the DAP and the file will be incremented each time an update is made and the DAP will be delivered to NSIDC. Reprocessing will be performed at the discretion of the algorithm team for quarterly updates. Reprocessing will be required for all critical updates.

Each algorithm team will determine when their product is validated. The team will notify the TLSCF and deliver new science software if necessary, The TLSCF will modify the PGE to reflect the science software changes and to change the product maturity indicator to "V" for validated. A reprocessing plan will be developed by the TLSCF and SIPS-GHCC. Reprocessing will proceed accordingly.

Once the data is validated, science software changes will be incorporated into the SIPS only twice a year.

# 7   Data Ingest, Archival And Distribution – NSIDC DAAC

## 7.1   Ingest and Archival of Science Data

### 7.1.1  AMSR-E Level 0 Products

The NSIDC DAAC intends to use the ECS to ingest and to archive AMSR-E Level 0 production data sets (PDS) and GBAD data sets provided by the NASA EDOS. The Level 0 products the NSIDC DAAC receives from EDOS are listed in Table 7.1. The NSIDC DAAC is responsible for the maintenance of ESDTs and any other information required to incorporate AMSR-E Level 0 data into the NSIDC DAAC ECS archive. The NSIDC DAAC monitors the receipt and reports on the insertion of the AMSR-E Level 0 data into the archive.

The NSIDC DAAC will ingest Level 0 data into the ECS archive using interfaces defined in the Interface Control Document between the Earth Observing System (EOS) Data and Operations System (EDOS) and the EOS Ground System (EGS) Elements (# 423-ICD-EDOS/EGS). EDOS transfers the AMSR-E Science and GBAD PDS and related metadata files to the ECS ingest server at the DAAC. NSIDC will archive the Level 0 products in the format provided by EDOS. The file naming convention used by EDOS for the PDS and GBAD data will be retained in the NSIDC archive. Each file contains any data collected by the EDOS during a two-hour period. The DAAC expects to receive these data from EDOS every two hours.

Table 7.1.  ESDT Short Names and Descriptions for data obtained from EDOS

| ESDT Short Name | ESDT Description |
|---|---|
| PM1GBAD1 | Ground-Based Attitude Determination Data for EOS Aqua in 1 second intervals |
| PM1GBAD4 | Ground-Based Attitude Determination Data for EOS Aqua in 4 second intervals |
| PM1GBAD8 | Ground-Based Attitude Determination Data for EOS Aqua in 8 second intervals |
| AE_PMSCI | AMSR-E Science and Engineering Data |

After the data have been successfully transferred to the ECS, the metadata file that accompanies the data granule is parsed and the information describing the data granule is stored in a database residing on the Science Data Server.  The data granule is archived on 9940 tape media.

### 7.1.2  Level 1A product

The AMSR-E Level 1A product will be generated at the National Space Development Agency (NASDA) Earth Observation Center located in Japan. The Level 1A product contains sensor counts and coefficients needed to compute antenna temperatures and, subsequently, surface brightness temperatures. The AMSR-E Level 1A granule is defined as one-half of one orbit, the division being at the poles, so that a granule is descending (North Pole to South Pole or ascending (South Pole to North Pole).   The Level 1A product will be produced using the National Center for Supercomputing Applications (NCSA) Hierarchical Data Format (HDF). The volume of each file is estimated to be an average of 35 MB, with a maximum of 42 megabytes. The data files will be transferred about once every 50 minutes from the NASDA/EOC to the Physical Oceanography DAAC (PO.DAAC) located at the Jet Propulsion Laboratory in Pasadena, California. Once the data have been received by the PO.DAAC the data are then transmitted over the network to the NSIDC DAAC and to Remote Sensing Systems, Inc.

The JPL PO.DAAC will transfer the AMSR-E L1A data files to a non-ECS file server at the NSIDC DAAC. The data will be transmitted using FastCopy, a commercial file transfer software package. Upon receipt of each L1A file a script will be activated that extracts metadata fields from the L1A file. The metadata fields will be used to produce a granule-level metadata file. The ECS Ingest Server requires a PVL-formatted metadata file for each data granule inserted into the archive.

After the metadata file has been generated, a Product Delivery Record (PDR) is produced. The PDR contains information needed by the ECS Ingest Polling Server. The PDR interface is described in the ICD between the ECS and the SIPS (document reference). The ECS ingest server at the NSIDC DAAC polls the PDR directory on the non-ECS server at NSIDC in an attempt to discover whether additional L1A data have been made available for insertion into the ECS archive.

After the data have been successfully transferred to the ECS, the metadata file that accompanies the data granule is parsed and the information describing the data granule is stored into a database residing on the Science Data Server.

## 7.1.3  Level 2 and 3 Products

The AMSR-E Level 2 and Level 3 products will be generated at the AMSR-E SIPS located at Remote Sensing Systems, Santa Rosa, CA, and Global Hydrology and Climate Center, Marshall Space Flight Center, Huntsville, AL. These products will be produced using algorithms developed by the United States AMSR-E Science Team members. The products will be generated in HDF-EOS file format. A description of the AMSR-E Level 2 and Level 3 data collections and their respective volumes are listed in Table 7.2.

The SIPS-GHCC delivers standard science data products via the co-located AMSR-E SIPS PDR Server. The PDR interface is described in the ICD between the ECS and the SIPS (ESDIS document no, 423-41-57-7).The ECS ingest server at the NSIDC DAAC polls the PDR directory at the AMSR-E SIPS in an attempt to discover whether additional Level 2 and Level 3 data have been made available for insertion into the ECS archive. Production History, and metadata files will accompany the data granule. The operations agreement between the AMSR-E SIPS and the NSIDC DAAC defines the number of granules identified in a single PDR (usually less than 30)

After the data have been successfully transferred to the ECS, the metadata file that accompanies the data granule is parsed and the information describing the data granule is stored into a database residing on the Science Data Server. The data granules and files containing the production history are archived on media residing in the near-line digital library.

## 7.2  Distribution

The NSIDC DAAC will establish and maintain distribution services for AMSR-E products using the EOSDIS Core System. It will also establish and maintain inventories, catalogs, and indices that facilitate the search and order of AMSR-E data sets. AMSR-E data providers will support this work by providing the necessary information (metadata) for its data sets.

Table 7.2. Level 2 and 3 data collections and their volumes.

| Short Name | Data Level | Collection Description | Delivery Frequency | Data Volume uncompressed |
|---|---|---|---|---|
| AE_L2A | Level 2A | AMSR-E/Aqua global swath brightness temperatures are resampled at resolutions of 56 km, 38 km, 21 km, 12 km, and 5.4 km. | ~28 half-orbits / day | 2.5 GB/day |
| AE_Ocean | Level 2B | AMSR-E/Aqua global swath ocean wind speed at 38 and 21 km res., water vapor over ocean at 21 km res., cloud liquid water at 12 km res., and sea surface temperature at 56 and 38 km res. are generated using the Wentz Algorithm and Level 2A product. | ~28 half-orbits /day | 277.2 MB/day |
| AE_Land | Level 2B | AMSR-E/Aqua global swath surface soil moisture and ancillary QC parameters including surface type, vegetation water content, and surface temp., and QC parms are generated from Level 2A AMSR-E Tb's spatially resampled to a nominal 25-km equal area earth grid. | ~28 half-orbits /day | 15.0 MB/day |
| AE_Rain | Level 2B | AMSR-E/Aqua global swath rain rate and rain type products are generated using the Level 2A spatially resampled Tb's and the Goddard Profiling Algorithm (GPROF). | ~28 half-orbits /day | 501.0 MB/day |
| AE_RnGd | Level 3 | AMSR-E/Aqua monthly rainfall accumulations are on two 5 x 5 degree grids, separate for land & ocean. The ocean product uses Level 2A brightness temperatures as input; the land product uses GPROF Level 2B rainfall as input. | 1 / month | 0.02 MB/month |
| AE_DyOcn | Level 3 | AMSR-E/Aqua global ocean Level 3 daily products are on .25 x .25 degree ascending and descending grids. Products are generated using the Level 2B ocean products as input. | 1 / day | 14.5 MB/day |
| AE_WkOcn | Level 3 | AMSR-E/Aqua global ocean Level 3 weekly products are on .25 x .25 degree ascending and descending grids. Products are generated using the Level 2B ocean products as input. | 1 / week | 12.4 MB/week |
| AE_MoOcn | Level 3 | AMSR-E/Aqua global ocean Level 3 monthly products are on .25 x .25 degree ascending and descending grids. Products are generated using the Level 2B ocean products as input. | 1 / month | 12.4 MB/month |
| AE_DySno | Level 3 | AMSR-E/Aqua Level 3 daily products are of global snow water equivalent on EASE-Grids. | 1 / day | 2.1 MB/day |
| AE_5DSno | Level 3 | AMSR-E/Aqua Level 3 5-day product is a 5-day running mean of global snow water equivalent on EASE-Grids. | 1 / day | 2.1 MB/ 5-day |
| AE_MoSno | Level 3 | AMSR-E/Aqua Level 3 product is of monthly global snow water equivalent on EASE-Grids. | 1 / month | 2.1 MB/ month |
| AE_SI6 | Level 3 | AMSR-E/Aqua Level 3 products at 6.25 km are of 89.0 GHz brightness temperatures on polar stereographic grids. Tb's are daily averages, daily ascending averages, and daily descending averages. | 1 / day | 46.3 MB/day |

| AE_SI12 | Level 3 | AMSR-E/Aqua Level 3 products at 12.5 km are of sea ice concentration, snow depth over ice, & 18 - 89.0 GHz Tb's on polar stereo grids. The sea ice con and Tb's are daily averages, daily asc. & desc. Averages; snow depth over sea ice is a 5-day average. | 1 / day | 53.0 MB/day |
|---|---|---|---|---|
| AE_SI25 | Level 3 | AMSR-E/Aqua Level 3 products at 25 km are of sea ice concentration, sea ice temperature, 6.9 - 89.0 GHz Tb's on polar stereographic grids. Sea ice con, sea ice temp, and Tb's are daily averages, daily ascending averages, and daily descending averages. | 1 / day | 19.5 MB/day |
| AE_Land3 | Level 3 | AMSR-E/Aqua Level 3 global daily surface soil moisture with QC parameters (vegetation water content, surface temp)))., & Tb's are generated on a nominal 25-km equal area earth grid by time-compositing the Level 2B parameters separately for ascending and descending passes. | 1 / day | 64.8 MB/day |

## 7.2.1  Distribution to NASDA/EOC

The NSIDC DAAC will distribute Level 0 data sets to the NASDA/EOC (for production and/or reprocessing) to the extent consistent with the NSIDC DAAC ECS resource limitations. NSIDC will distribute all AMSR-E Level 0 Science and GBAD data to NASDA/EOC for the first ninety (90) days of the Aqua mission; afterwards, the DAAC will provide these products only as a backup to the bit rate buffered Level 0 data. The bit rate buffered data is the primary source for L1A production at the NASDA/EOC.  Details pertaining to ordering procedures and transfer media for the Level 0 data exchange with NASDA/EOC can be found in the Operations Agreement between NSIDC DAAC and the NASDA/EOC for the exchange of AMSR-E data.

## 7.2.2  Distribution to AMSR-E Science Team Members

The NSIDC DAAC will distribute data sets to the AMSR-E SCF as required to perform science quality assurance or for science investigations to the extent consistent with the NSIDC DAAC ECS resource limitations. AMSR-E Team members may order the data products from the NSIDC User Services Office and acquire the data via ftp or physical media (CD or DVD). Alternatively, team members may establish a subscription on the data and have the data automatically sent to a host computer via ftp.

## 7.2.3  Distribution to the General Science Community

As per the current NASA ESDIS Project policy for Aqua data, the NSIDC DAAC will distribute AMSR-E products on a non-discriminatory basis to all users at no charge.  If policy changes eventually are implemented, prices will reflect the cost of media, postage, and materials only.  The priority for distribution will be on a first-in first-out basis. Data orders will be accepted through the NASA EOSDIS Data Gateway, or by traditional means such as E-mail, telephone, facsimile or the NSIDC AMSR-E web site.

## 7.2.4  AMSR-E Science Software Distribution to Users

Upon user request the NSIDC DAAC will distribute a Delivered Algorithm Package (DAP) of AMSR-E software needed to create an executable that produces one of the AMSR-E data sets on one of

the approved system configurations (computing equipment, operating system, compiler, Toolkits, HDF, etc).

## 7.3   Ingest and Archival of Other Data

### 7.3.1   Validation data

The AMSR-E Validation data will be archived at NSIDC.  In order to make these data available to the public NSIDC will create a web site where all data taken for AMSR-E validation will be listed with pointers to where the data reside and the contact person responsible for that set of data.  Most of the time, the scientists involved in taking the data will have them at his/her facility at least a year after the campaign has been completed.  During that period (a year after a validation campaign) the Validation web site will note the procedure for obtaining the data set in question.

### 7.3.2   Browse data

AMSR-E browse images will be generated at the SIPS-GHCC.  They will be available to the general public on the AMSR-E web site, after the scientists are satisfied that the images are correct.  These images will then be transferred to the NSIDC DAAC via the SIPS PDRS interface.

### 7.3.3   Research data products

Some of the AMSR-E Science team members will produce research products at their own SCF. For these products the public is invited to contact the individual scientist directly.  These data will not be archived at NSIDC.  The research products are listed in Table 4.4.

## 7.4   Data Configuration Management (at NSIDC)

Configuration management of the AMSR-E standard data products is the joint responsibility of the SIPS and the NSIDC DAAC. Standard AMSR-E data products are produced at SIPS-GHCC and transmitted to the EOSDIS Core System (ECS) at the NSIDC DAAC for archival. Each data collection archived in the ECS is described as an Earth Science Data Type (ESDT). An ESDT is uniquely defined by a set of attributes contained in an ESDT descriptor file. The NSIDC DAAC and the SIPS agree on the contents of the collection descriptor file prior to establishing a baseline or operational version of the ESDT.

The metadata that uniquely defines an ESDT contains an attribute that provides a version identifier of the ESDT collection. Normally, the version identifier of the baseline version of the data collection is set to one (1). The version identifier can be used to distinguish collections of the same ESDT that were produced using different algorithms, resulting in a collection of reprocessed granules. In time, the data provider or the DAAC may wish to make changes to the mandatory metadata attributes that define the ESDT; significant changes to the ESDT descriptor may result in the definition of a new version of the ESDT. Usually, the DAAC advertises only the most recent version of an ESDT collection. Prior versions are deleted from the archive, as governed by the NASA EOS Data and Information Policy.

The NSIDC DAAC will collaborate with the SIPS prior to making a change to the metadata elements that describes an ESDT. No changes to an ESDT are implemented within the ECS installed at the NSIDC DAAC until both the DAAC management and the SIPS agree to the proposed changes. Procedures for negotiating a change to the ESDT definition are described in the operations agreement between the NSIDC DAAC and SIPS. Changes to an ESDT that introduces a new version of the data collection will be published in the applicable Data Set Guide document.

The latest version of the AMSR-E standard data products are maintained in the ECS archive installed at the NSIDC DAAC for the duration of the AMSR-E mission. The NSIDC DAAC maintains the archive until the collections have been migrated to a Long-Term Archive (LTA) facility.

# 8   Implementation Schedule

This document describes what happens to the AMSR-E data after the launch of Aqua.  In that respect this is a "living" document, especially this section.  Listed below are the major milestones for updating the science algorithms and subsequently reprocessing the data.  At this point, these processes are envisioned to proceed in a well-organized fashion, as follows.

**Milestones**

Launch (L): May 4, 2002
Continuous data from Japan: June 18, 2003
Continuous processing, archive and distribution: March 1, 2004

**Science Algorithms**

On May 4, 2002, launch-ready algorithms are integrated and ready for processing at the SIPS.

On March 1, 2004, the science software will become version 1, standard products and DAPs will be archived at NSIDC and available to all users.

Between March 1, 2004 and March 1, 2005 updates may be made quarterly.

After March 1, 2005 updates may be made on a semiannual basis.

**Processing at SIPS**

March 1 2004: continuous processing of standard products which will be delivered to NSIDC for archive and distribution to users.  The processing will be dual stream: forward from March 1, 2004, and, at the same time, forward from June 1, 2002.

Reprocessing will be performed at the discretion of the algorithm team for quarterly updates. Reprocessing will be required for all critical updates and will be coordinated with the TLSCF and NSIDC.

## Acronyms

| | |
|---|---|
| AMSR-E | Advanced Microwave Scanning Radiometer – EOS |
| asc | ascending |
| AVHRR | Advanced Very High Resolution Radiometer |
| CD-R | Compact Disk-Re-writable |
| CM | Configuration Management |
| CSU | Colorado State University |
| CVS | Concurrent Versions System |
| DAAC | Distributed Active Archive Center |
| DAP | Delivered Algorithm Package |
| desc | descending |
| DVD | Digital Video Disk |
| ECS | EOSDIS Core System |
| EDOS | EOS Data and Operations System |
| EGS | EOS Ground System |
| EOC | Earth Observation Center |
| EORC | Earth Observations Resource Center |
| EOS | Earth Observing System |
| EOSDIS | EOS Data Information System |
| ESDIS | Earth Science Data Information System (Project) |
| ESDT | Earth Science Data Type |
| ESE | Earth Science Enterprise |
| FTP | File Transfer Protocol |
| GB/day | Gigabyte/day |
| GBAD | Ground Based Attitude Determination |
| GCTP | General Coordinate Transformation Package |
| GHCC | Global Hydrology and Climate Center |
| GHRC | Global Hydrology Resource Center |
| GHz | Giga Hertz |
| GPROF | Goddard PROFiling algorithm |
| GSFC | Goddard Space Flight Center |
| HDF | Hierarchical Data Format |
| ICD | Interface Control Document |
| ICESat | Ice, Cloud and land Elevation Satellite |
| IDL | Interactive Display Language |

| | |
|---|---|
| IT | Instrument Team |
| JPL | Jet Propulsion Laboratory |
| Km | Kilometer |
| LTA | Long Term Archive |
| MHz | Mega Hertz |
| MODIS | MODerate-resolution Imaging Spectraradiometer |
| MODAPS | MODIS Data Processing System |
| MSFC | Marshall Space Flight Center |
| MTMGW | |
| NASA | National Aeronautics and Space Administration |
| NASDA | National Space Development Agency (of Japan) |
| NCSA | National Center for Supercomputing Applications |
| NESDIS | National Environmental Satellite, Data, and Information Service |
| NOAA | National Oceanic and Atmospheric Administration |
| NHP | number of pixels/scan for 89 GHz channels |
| NP | number of pixels/scan |
| NS | number of scans |
| NSIDC | National Snow and Ice Data Center |
| OA | Operations Agreement |
| ODL | Object Data Language |
| PAN | Product Acceptance Notification |
| PI | Principal Investigator |
| PDRD | Product Delivery Record Discrepancy |
| PDR | Product Delivery Record |
| PDRS | Product Delivery Record Server |
| PDS | Production Data Sets |
| PGE | Product Generation Executable |
| POC | Point Of Contact |
| PO.DAAC | Physical Oceanography DAAC |
| QA | Quality Assurance |
| RSS | Remote Sensing Systems |
| RTS | Return To Service |
| SIPS | Science Investigator-led Processing System |
| SCF | Science Computing Facility |
| SMMR | Scanning Multichannel Microwave Radiometer |
| SSH | |
| SSI&T | Science Software Integration & Test |

| | |
|---|---|
| SSM/I | Special Sensor Microwave/Imager |
| SSMIS | Special Sensor Microwave Imager Sounder |
| SST | Sea Surface Temperature |
| TAMU | Texas A&M University |
| TBD | To Be Determined |
| TBW | To Be Written |
| Tb | Brightness Temperature |
| TLSCF | Team Lead Science Computing Facility |
| TMI | TRMM Microwave Imager |
| TRMM | Tropical Rainfall Measurement Mission |
| UAH | University of Alabama in Huntsville |
| UPS | Uninterruptible Power Supply |

# Appendix I

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# Appendix II

Table 1.  AMSR-E Level 2A granule contents

| Parameter | Data Type | Dimensions | Description |
|---|---|---|---|
| **Low_Res_Swath** | | | |
| **Swath Attributes** | | | |
| OrbitSemiMajorAxis | Character | | |
| OrbitEccentricity | Character | | |
| OrbitArgumentPerigee | Character | | |
| OrbitInclination | Character | | |
| OrbitPeriod | Character | | |
| EllipsoidName | Character | | |
| SemiMajorAxisofEarth | Character | | |
| FlatteningRatioofEarth | Character | | |
| Platinum#1CountRangeWx | Character | | |
| Platinum#1ConversionTableWa | Character | | |
| Platinum#1ConversionTableWb | Character | | |
| Platinum#1ConversionTableWc | Character | | |
| Platinum#1ConversionTableWd | Character | | |
| CoefficientAvv | Character | | |
| CoefficientAhv | Character | | |
| CoefficientAov | Character | | |
| CoefficientAhh | Character | | |
| CoefficientAvh | Character | | |
| CoefficientAoh | Character | | |
| Level1A_Channel_Sequence | Character | | |
| Resampled_Channel_Sequence | Character | | |
| StartOrbitNumber | Float | | |
| StopOrbitNumber | Float | | |
| EquatorCrossing | Character | | |
| EquatorCrossingDate | Character | | |
| EquatorCrossingTime | Character | | |
| OrbitDirection | Character | | |
| NumberofScans | Int32 | | |
| SoftwareRevisionDate | Character | | |
| SoftwareBuildNumber | Int32 | | |
| PGE_Version | INT32 | | |
| RangeBeginningTime | Char8 | | |
| RangeBeginningDate | Char8 | | |
| RangeEndingTime | Char8 | | |
| TangeEndingDate | Char8 | | |
| InputPointer | Char8 | | |
| | | | |
| | | | |

| | | | |
|---|---|---|---|
| Table 1   AMSR-E Level 2A granule contents (cont) | | | |
| **Geolocation fields** | | | |
| Time | FLOAT64 | NS | Scan start time in TAI93 |
| Latitude | FLOAT32 | NS x  NHP | Latitude (-90.0 to 90.0) |
| Longitude | FLOAT32 | NS x  NHP | Longitude( -180.0 to 180.0) |
| **Low_Res Swath** | | | |
| **Data Fields** | | | |
| Position_in_Orbit | FLOAT32 | NS | Fractional orbit position of current scan |
| Navigation_Data | FLOAT32 | NS x 6 | x,y,z,vx,vy,vz (km, km/sec) |
| Attitude_Data | FLOAT32 | NS x 3 | Roll, pitch, and yaw measured from nominal position |
| SPC_Temperature_Count | UINT16 | NS x 20 | (In NASDA documentation) |
| SPS_Temperature_Count | UINT16 | NS x 32 | (In NASDA Documentation) |
| RX_Offset_Gain_Count | UINT16 | NS x 32 | |
| Data_Quality | FLOAT32 | NS x 128 | Level 1A data quality flags |
| Observation Supplement | UINT16 | NS x 27 | (In NASDA Documentation) |
| Land_Ocean_Flag | UINT8 | NS x NO x 6 | Level 1A land/ocean flags stored as percent of land in pixel |
| Earth_Incidence | INT8 | NS x  NP | Earth incidence angle |
| Earth_Azimuth | INT16 | NS x  NP | Earth azimuth angle |
| Sun_Elevation | INT16 | NS x  NP | Sun elevation angle |
| Sun_Azimuth | INT16 | | Sun azimuth angle |
| NASDA_LowRes_Antenna_Temp_Coefficients | FLOAT32 | NS x 10 x 2 | |
| RSS_LowRes_Antenna_Temp_Coefficients | FLOAT32 | NS x 10 x 2 | |
| Hot_Load_Count_6_to_37 | UINT16 | NS x 16 x 10 | Hot load calibration counts for the low resolution channels |
| Cold_Sky_Mirror_Count_6_to_37 | UINT16 | NS x 16 x 10 | Cold sky calibration counts for the low resolution channels |
| Scan_Quality_Flag | INT32 | NS | Overall scan quality flag |
| Level1A_Scan_Chan_Quality_Flag | INT16 | NS x 10 | Quality flags for each Level 1A scan and channel |
| Resampled_Scan_Chan_Quality_Flag | INT16 | NS x 30 | Quality flag for each resampled scan and channel |
| Sun_Glint_Angle | INT16 | NS x NP | |

| Table 1    AMSR-E Level 2A granule contents (cont) | | | |
|---|---|---|---|
| **Parameter** | **Data Type** | **Dimensions** | **Description** |
| 6.9V_Res.1_TB_(Level1B) | INT16 | NS x NP | |
| 6.9H_Res.1_TB_(Level1B) | INT16 | NS x NP | |
| 10.7V_Res.2_TB_(Level1B) | INT16 | NS x NP | |
| 10.7H_Res.2_TB_(Level1B) | INT16 | NS x NP | |
| 18.7V_Res.3_TB_(Level1B) | INT16 | NS x NP | |
| 18.7H_Res.3_TB_(Level1B) | INT16 | NS x NP | |
| 23.8V_Approx._Res.3_TB_(Level1B) | INT16 | NS x NP | |
| 23.8H_Approx._Res.3_TB_(Level1B) | INT16 | NS x NP | |
| 36.5V_Res.4_TB_(Level1B) | INT16 | NS x NP | |
| 36.5H_Res.4_TB_(Level1B) | INT16 | NS x NP | |
| 6.9V_Res.1_TB | INT16 | NS x NP | Resolution 1   6.9V Channel TBs |
| 6.9H_Res.1_TB | INT16 | NS x NP | Resolution 1   6.9H Channel TBs |
| 10.7V_Res.1_TB | INT16 | NS x NP | Resolution 1 10.7V Channel TBs |
| 10.7V_Res.2_TB | INT16 | NS x NP | Resolution 2 10.7V Channel TBs |
| 10.7H_Res.1_TB | INT16 | NS x NP | Resolution 1 10.7H Channel TBs |
| 10.7H_Res.2_TB | INT16 | NS x NP | Resolution 2 10.7H Channel TBs |
| 18.7V_Res.1_TB | INT16 | NS x NP | Resolution 1 18.7V Channel TBs |
| 18.7V_Res.2_TB | INT16 | NS x NP | Resolution 2 18.7V Channel TBs |
| 18.7H_Res.1_TB | INT16 | NS x NP | Resolution 1 18.7H Channel TBs |
| 18.7H_Res.2_TB | INT16 | NS x NP | Resolution 2 18.7H Channel TBs |
| 23.8V_Res.1_TB | INT16 | NS x NP | Resolution 1 23.8V Channel TBs |
| 23.8V_Res.2_TB | INT16 | NS x NP | Resolution 2 23.8V Channel TBs |
| 23.8V_Res.3_TB | INT16 | NS x NP | Resolution 3 23.8V Channel TBs, not resampled |
| 23.8H_Res.1_TB | INT16 | NS x NP | Resolution 1 23.8H Channel TBs |
| 23.8H_Res.2_TB | INT16 | NS x NP | Resolution 2 23.8H Channel TBs |
| 23.8H_Res.3_TB | INT16 | NS x NP | Resolution 3 23.8H Channel TBs, not resampled |
| 36.5V_Res.1_TB | INT16 | NS x NP | Resolution 1 36.5V Channel TBs |
| 36.5V_Res.2_TB | INT16 | NS x NP | Resolution 2 36.5V Channel TBs |
| 36.5V_Res.3_TB | INT16 | NS x NP | Resolution 3 36.5V Channel TBs |
| 36.5H_Res.1_TB | INT16 | NS x NP | Resolution 1 36.5H Channel TBs |
| 36.5H_Res.2_TB | INT16 | NS x NP | Resolution 2 36.5H Channel TBs |
| 36.5H_Res.3_TB | INT16 | NS x NP | Resolution 3 36.5H Channel TBs |
| 89.0V_Res.1_TB | INT16 | NS x NP | Resolution 1 89.0V Channel TBs |
| 89.0V_Res.2_TB | INT16 | NS x NP | Resolution 2 89.0V Channel TBs |
| 89.0V_Res.3_TB | INT16 | NS x NP | Resolution 3 89.0V Channel TBs |
| 89.0V_Res.4_TB | INT16 | NS x NP | Resolution 4 89.0V Channel TBs |
| 89.0H_Res.1_TB | INT16 | NS x NP | Resolution 1 89.0H Channel TBs |
| 89.0H_Res.2_TB | INT16 | NS x NP | Resolution 2 89.0H Channel TBs |
| 89.0H_Res.3_TB | INT16 | NS x NP | Resolution 3 89.0H Channel TBs |
| 89.0H_Res.4_TB | INT16 | NS x NP | Resolution 4 89.0H Channel TBs |
| Res1_Surf | UINT8 | NS x NP | Resolution 1 Surface Types |
| Res2_Surf | UINT8 | NS x NP | Resolution 2 Surface Types |
| Res3_Surf | UINT8 | NS x NP | Resolution 3 Surface Types |
| Res4_Surf | UINT8 | NS x NP | Resolution 4 Surface Types |

Table 1 AMSR-E Level 2A granule contents (cont.)

| Parameter | Data Type | Dimensions | Description |
|---|---|---|---|
| **High_Res_A Swath** | | | |
| **Swath Attributes** | | | |
| OrbitSemiMajorAxis | Character | | |
| OrbitEccentricity | Character | | |
| OrbitArgumentPerigee | Character | | |
| OrbitIncination | Character | | |
| OrbitPeriod | Character | | |
| EllipsoidName | Character | | |
| DemiMajorAxisofEarth | Character | | |
| FlatteningRatioofEarth | Character | | |
| Platinum#1CountRangeWx | Character | | |
| Platinum#1ConversionTableWa | Character | | |
| Platinum#1ConversionTableWb | Character | | |
| Platinum#1ConversionTableWc | Character | | |
| Platinum#1ConversionTableWd | Character | | |
| CoefficientAvv | Character | | |
| CoefficientAhv | Character | | |
| CoefficientAov | Character | | |
| CoefficientAhh | Character | | |
| CoefficientAvh | Character | | |
| CoefficientAoh | Character | | |
| Level1A_Channel_Sequence | Character | | |
| Resampled_Channel_Sequence | Character | | |
| StartOrbitNumber | Float | | |
| StopOrbitNumber | Float | | |
| EquatorCrossing | Character | | |
| EquatorCrossingDate | Character | | |
| EquatorCrossingTime | Character | | |
| OrbitDirection | Character | | |
| NumberofScans | INT32 | | |
| SoftwareRevisionDate | Character | | |
| SoftwareBuildNumber | INT32 | | |
| **Geolocation fields** | | | |
| Time | FLOAT64 | NS | Scan start time in TAI93 |
| Latitude | FLOAT32 | NS x NHP | Latitude (-90.0 to 90.0) |
| Longitude | FLOAT32 | NS x NHP | Longitude( -180.0 to 180.0) |
| **Data Fields** | | | |
| NASDA_HighRes_Antenna_Temp_Coefficients | FLOAT32 | NS x 2 x 2 | Antenna temperature coefficients for the high resolution channels |
| RSS_HighRes_Antenna_Temp_Coefficients | FLOAT32 | NS x 2 x 2 | Antenna temperature coefficients for the high resolution channels |
| AscanCold_Sky_Mirror_Count_89 | UINT16 | NS x 32 x 2 | Cold sky calibration counts for the 89 GHz A scans |
| AscanHot_Load_Count_89 | UINT16 | NS x 32 x 2 | Hot load calibration counts for the 89 GHz A scans |
| Scan_Quality_Flag | INT32 | NS | Overall scan quality flag |
| Level1A_89Ascan_Chan_Quality_Flag | INT16 | NS x 2 | Quality flag for each Level 1A scan and channel |
| 89.0V_Res.5A_TB_(Level1B) | INT16 | NS x NHP | Brightness Temperatures for the 89 GHz vertical channel A scans |
| 89.0H_Res.5A_TB_(Level1B) | INT16 | NS x NHP | Brightness Temperatures for the 89 |

| Parameter | Data Type | Dimensions | Description |
|---|---|---|---|
| | | | GHz horizontal channel A scans |
| Res5A_Surf | UINT8 | NS x NHP | Surface tags for the 89 GHz A scans |

Table 1 AMSR-E Level 2A granule contents (cont.)

| Parameter | Data Type | Dimensions | Description |
|---|---|---|---|
| **High_Res_B Swath** | | | |
| **Swath Attributes** | | | |
| OrbitSemiMajorAxis | Character | | |
| OrbitEccentricity | Character | | |
| OrbitArgumentPerigee | Character | | |
| OrbitIncination | Character | | |
| OrbitPeriod | Character | | |
| EllipsoidName | Character | | |
| DemiMajorAxisofEarth | Character | | |
| FlatteningRatioofEarth | Character | | |
| Platinum#1CountRangeWx | Character | | |
| Platinum#1ConversionTableWa | Character | | |
| Platinum#1ConversionTableWb | Character | | |
| Platinum#1ConversionTableWc | Character | | |
| Platinum#1ConversionTableWd | Character | | |
| CoefficientAvv | Character | | |
| CoefficientAhv | Character | | |
| CoefficientAov | Character | | |
| CoefficientAhh | Character | | |
| CoefficientAvh | Character | | |
| CoefficientAoh | Character | | |
| Level1A_Channel_Sequence | Character | | |
| Resampled_Channel_Sequence | Character | | |
| StartOrbitNumber | Float | | |
| StopOrbitNumber | Float | | |
| EquatorCrossing | Character | | |
| EquatorCrossingDate | Character | | |
| EquatorCrossingTime | Character | | |
| OrbitDirection | Character | | |
| NumberofScans | INT32 | | |
| SoftwareRevisionDate | Character | | |
| SoftwareBuildNumber | INT32 | | |
| **Geolocation fields** | | | |
| Time | FLOAT64 | NS | Scan start time in TAI93 |
| Latitude | FLOAT32 | NS x NHP | Latitude (-90.0 to 90.0) |
| Longitude | FLOAT32 | NS x NHP | Longitude (-180.0 to 180.0) |
| **Data Fields** | | | |
| NASDA_HighRes_Antenna_Temp_Coefficients | FLOAT32 | NS x 2 x 2 | Antenna temperature coefficients for the high resolution channels |
| RSS_HighRes_Antenna_Temp_Coefficients | FLOAT32 | NS x 2 x 2 | Antenna temperature coefficients for the high resolution channels |
| BscanCold_Sky_Mirror_Count_89 | UINT16 | NS x 32 x 2 | Cold sky calibration counts for the 89 GHz A scans |
| BscanHot_Load_Count_89 | UINT16 | NS x 32 x 2 | Hot load calibration counts for the |

| | | | 89 GHz A scans |
|---|---|---|---|
| Scan_Quality_Flag | INT32 | NS | Overall scan quality flag |
| Level1A_89Ascan_Chan_Quality_Flag | INT16 | NS x 2 | Quality flag for each Level 1A scan and channel |
| 89.0V_Res.5B_TB_(Level1B) | UINT16 | NS x NHP | Brightness Temperatures for the 89 GHz vertical channel A scans |
| 89.0H_Res.5B_TB_(Level1B) | UINT16 | NS x NHP | Brightness Temperatures for the 89 GHz horizontal channel A scans |
| Res5B_Surf | UINT8 | NS x NHP | Surface tags for the 89 GHz A scans |

Where NS Is the number of scans (nominally 2000), NP is the number of pixels per scan for low channels (nominally 243) and NHP is the number of pixels per scan for 89 GHz channels (2 * NP).

Table 2 Level 2A Ancillary files

| File Name | Description | Type | Source | Volume (MB) |
|---|---|---|---|---|
| WT files | weighting coefficients | Static | RSS | 17 |
| Land mask | | Static | RSS | |
| | | | | |

Table 3 AMSR-E Level 2B Ocean Products granule contents

| Parameter | Data Type | Dimensions | Description |
|---|---|---|---|
| **Swath 1** | | | |
| **Geolocation Fields** | | | |
| Time | FLOAT64 | NS | Scan start time in TAI93 |
| Latitude | FLOAT32 | NS x NP | Latitude (-90.0 to 90.0) |
| Longitude | FLOAT32 | NS x NP | Longitude (-180.0 to 180.0) |
| **Data Fields** | | | |
| Scan_summary_flag | INT32 | NS | Overall quality flag |
| Ocean_summary_quality_flag | INT8 | NS | TBD |
| Ocean_products_quality_flag | INT8 | NS x NP x 4 | TBD |
| Very_low_res_sst | INT16 | NS x NP | SST at the resolution of the 6.9 GHz footprint (56 km) |
| Low_res_sst | INT16 | NS x NP | SST at the resolution of the 10.7 GHz footprint (38 km) |
| Low_res_wind | INT16 | NS x NP | Wind speed at the resolution of the 10.7 GHz footprint (38 km) |
| Med_res_wind | INT16 | NS x NP | Wind speed at the resolution of the 18.9 GHz footprint (21 km) |
| Med_res_vapor | INT16 | NS x NP | Water vapor at the resolution of the 18.9 GHz footprint (21 km) |
| High_res_cloud | INT16 | NS x NP | Cloud water at the resolution of the 36.5 GHz footprint (12 km) |

Table 4 Level 2B Ocean Products Ancillary files.

| File Name | Description | Type | Source | Volume (MB) |
|---|---|---|---|---|
| Mergwin_vap_v2.txt | climate mask | Static | RSS | 6.3 |
| reynolds_clim.txt | sea surface temperature mask | Static | RSS | 3.1 |
| tables_amsr.lis | geophysical constants | Static | RSS | 0.1 |
| tb_coefs_amsr_lores.lis | Coefficients in series expansion for low resolution products | Static | RSS | 1.6 |
| tb_coefs_amsr_mdres.lis | Coefficients in series expansion for medium resolution products | Static | RSS | 0.7 |
| tb_coefs_amsr_vlres.list | Coefficients in series expansion for very low resolution products | Static | RSS | 2.0 |

Table 5 Level 2B Surface Soil Moisture granule contents

| Parameter | Data Type | Dimension | Description |
|---|---|---|---|
| **Geolocation Fields** | | | |
| Time | FLOAT 64 | NLAND | Scan start time in TAI 93 |
| Latitude | FLOAT 32 | NLAND | Latitude (-90.0 to 90.0) |
| Longitude | FLOAT 32 | NLAND | Longitude (-180.0 to 180.0) |
| **Data Fields** | | | |
| Row_Index | INT16 | NLAND | EASE grid row index |
| Column_Index | INT16 | NLAND | EASE grid column index |
| TB_QC_Flag | INT16 | NLAND | TB quality control flag |
| Heterogeneity_Index | INT16 | NLAND | Subpixel variability index |
| Surface_Type | INT16 | NLAND | Surface type flag |
| Soil_Moisture | INT16 | NLAND | Soil moisture at 6.9 GHz resolution |
| Veg_Water_Content | INT16 | NLAND | Vegetation QC vegetation water content at 6.9 GHz resolution |
| Land_Surface_Temp | INT16 | NLAND | QC lLand surface temperature at 6.9 GHz resolution |
| Inversion_QC_Flag_1 | INT16 | NLAND | Inversion quality control flag |
| Inversion_QC_Flag_2 | INT16 | NLAND | Number of iterations (if applicable) |
| Inversion_QC_Flag_3 | INT16 | NLAND | $\chi^2$ of iterations (if applicable) |

Where NLAND is the number of EASE-gridded land observations in the granule. Note that NLAND will vary, with an average of ~14000 observations per granule.

Table 6 AMSR-E Level 2B Surface Soil Moisture Ancillary Files

| File Name | Description | Type | Source | Update Frequency | Update Method | Volume (MB) |
|---|---|---|---|---|---|---|
| ldwat1.dat | Water cover database | Static | JPL/Njoku | N/A | N/A | 0.8 |
| texture1.dat | Soil texture database | Static | JPL/Njoku | N/A | N/A | 1.6 |
| snowimp1.dat | Snow/ice-sheet database | Static | JPL/Njoku | N/A | N/A | 0.8 |
| topo1.dat | Topography database | Static | JPL/Njoku | N/A | N/A | 3.2 |
| veg1.dat | Vegetation database | Static | JPL/Njoku | N/A | N/A | 1.6 |
| prgprms.dat | Program parameters | Static | JPL/Njoku | | | (140 bytes) |
| invprms.dat | Inversion parameters | Static | JPL/Njoku | | | (232 bytes) |
| modprms.dat | TB model parameters | Static | JPL/Njoku | | | (230 bytes) |
| clsprms.dat | Classification parameters | Static | JPL/Njoku | | | (200 bytes) |

Table 7 AMSR-E Level 2B Rainfall granule contents

| Parameter | Data Type | Dimensions | Description |
|---|---|---|---|
| L2B Rainfall Products | | | |
| Geolocation Fields | | | |
| Time | FLOAT64 | NHS | Scan start time in TAI93 |
| Latitude | FLOAT32 | NHS x NHP | Latitude (-90.0 to 90.0) |
| Longitude | FLOAT32 | NHS x NHP | Longitude( -180.0 to 180.0) |
| Data Fields | | | |
| Rain Rate | INT16 | NHS x NHP | Rain rate, mm/hr |
| Rain Type | INT8 | NHS x NHP | Rain type: Convective or Stratiform |

Where NHS is the number of 89 GHz scans (nominally 4000) and NHP is the number of 89 GHz observations per scan (nominally 392).

Table 8 AMSR-E Level 2B Rainfall ancillary files

| File Name | Description | Type | Source | Volume (MB) |
|---|---|---|---|---|
| ALL-W300-v5.1.dbase | Ocean Profile database with SST | Static | GSFC/CSU Kummerow | 2.0 |
| ALL-W300-v5.1a.dbase | Ocean Profile database with SST | Static | GSFC/CSU Kummerow | 0.5 |
| ALL-W300-v5.1b.dbase | Ocean Profile database with SST | Static | GSFC/CSU Kummerow | 0.6 |
| Clim-sst.dbase | Climatology and SST database | Static | GSFC/CSU Kummerow | 0.3 |
| G2D-W300-v5.I.dbase | Ocean Profile database with SST | Static | GSFC/CSU Kummerow | 0.3 |
| GCE-C300-v5.4.dbase | Ocean Profile database with SST | Static | GSFC/CSU Kummerow | 1.1 |
| GCE-L300-v5.4.dbase | Ocean Profile database with SST | Static | GSFC/CSU Kummerow | 0.1 |
| GCE-W288-v5.I.dbase | Ocean Profile database with SST | Static | GSFC/CSU Kummerow | 0.8 |
| GCE-W292-v5.I.dbase | Ocean Profile database with SST | Static | GSFC/CSU Kummerow | 0.8 |
| GCE-W296-v5.I.dbase | Ocean Profile database with SST | Static | GSFC/CSU Kummerow | 0.8 |
| Sfctype93.dbase | surface type data base | Static | GSFC/CSU Kummerow | 2.1 |
| Wilheit.dbase | Freezing level database | Static | TAMU/Wilheit | 0.1 |

Table 9.  AMSR-E Level 3 Daily Ocean Products

| Parameter | Data Type | Dimensions | Description |
|---|---|---|---|
| **Ascending_Ocean_Grids** | | | |
| Very_low_res_sst | INT8 | 720 x 1440 | SST at the resolution of 6.9 GHz footprint (56 km). |
| Low_res_sst | INT8 | 720 x 1440 | SST at the resolution of 10.7 GHz footprint (38 km). |
| Low_res_wind | INT8 | 720 x 1440 | Wind speed over ocean at the resolution of 10.7 GHz footprint (38 km). |
| Med_res_wind | INT8 | 720 x 1440 | Wind speed over ocean at the resolution of 18.9 GHz footprint (21 km). |
| Med_res_vapor | INT8 | 720 x 1440 | Water vapor over ocean at  the resolution of 18.9 GHz footprint (21 km). |
| High_res_cloud | INT8 | 720 x 1440 | Cloud water over ocean at the resolution of 36.5 GHz footprint (12 km). |
| **Descending_Ocean_Grids** | | | |
| Very_low_res_sst | INT8 | 720 x 1440 | SST at the resolution of 6.9 GHz footprint (56 km). |
| Low_res_sst | INT8 | 720 x 1440 | SST at the resolution of 10.7 GHz footprint (38 km). |
| Low_res_wind | INT8 | 720 x 1440 | Wind speed over ocean at the resolution of 10.7 GHz footprint (38 km). |
| Med_res_wind | INT8 | 720 x 1440 | Wind speed over ocean at the resolution of 18.9 GHz footprint (21 km). |
| Med_res_vapor | INT8 | 720 x 1440 | Water vapor over ocean at  the resolution of 18.9 GHz footprint (21 km). |
| High_res_cloud | INT8 | 720 x 1440 | Cloud water over ocean at the resolution of 36.5 GHz footprint (12 km). |

Table 10.  AMSR-E Level 3 Daily Snow File Format

| Parameter | Data Type | Dimensions | Description |
|---|---|---|---|
| **Northern Hemisphere** | | | |
| **Data Fields** | | | |
| SWE_NorthernDaily | UINT8 | 721 x 721 | Daily snow water equivalent for the Northern Hemisphere |
| Depth_NorthernDaily | UINT8 | 721 x 721 | Daily snow depth for the Northern Hemisphere |
| Flags_NorthernDaily | UINT8 | 721 x 721 | Daily quality assurance flags for the Northern Hemisphere |
| **Southern Hemisphere** | | | |
| **Data Fields** | | | |
| SWE_SouthernDaily | UINT8 | 721 x 721 | Daily snow water equivalent for the Southern Hemisphere |
| Depth_SouthernDaily | UINT8 | 721 x 721 | Daily snow depth for the Southern Hemisphere |
| Flags_SouthernDaily | UINT8 | 721 x 721 | Daily quality assurance flags for the Southern Hemisphere |

Table 11.  AMSR-E Level 3 SWE Ancillary Files

| File Name | Description | Type | Source | Update Frequency | Update Method | Volume (MB) |
|---|---|---|---|---|---|---|
| SWEDynamicInput | Computed snow status of each global map grid from the previous run | Dynamic | Half-orbit PGE | Each half-Orbit | PGE | 2.0 |
| SnowImpossible_EASE-Grid_Both | Classification of each global map grid as water, snow possible land, and snow impossible land | Static | GSFC/Chang | N/A | | 1.1 |
| albedo_EASE-Grid_Both | albedo for each global map grid | Static | GSFC/Chang | N/A | | 4.2 |
| snowclass_EASE-Grid_Both | land classification for each global map grid | Static | GSFC/Chang | N/A | | 1.1 |

Table 12 AMSR-E Level 3 6.25 km Sea Ice Products

| Parameter | Data Type | Dimensions | Description |
|---|---|---|---|

| Parameter | Data Type | Dimensions | Description |
|---|---|---|---|
| **NpPolarGrid06km** | | | |
| **Data Fields** | | | |
| 89.0V NP ASC | INT16 | 1216 x 1792 | 89.0 GHz vertical daily average ascending TBs |
| 89.0V NP DSC | INT16 | 1216 x 1792 | 89.0 GHz vertical daily average descending TBs |
| 89.0V NP DAILY | INT16 | 1216 x 1792 | 89.0 GHz vertical daily average TBs |
| 89.0H NP ASC | INT16 | 1216 x 1792 | 89.0 GHz horizontal daily average ascending TBs |
| 89.0H NP DSC | INT16 | 1216 x 1792 | 89.0 GHz horizontal daily average descending TBs |
| 89.0H NP DAILY | INT16 | 1216 x 1792 | 89.0 GHz horizontal daily average TBs |
| **SpPolarGrid06km** | | | |
| **Data Fields** | | | |
| 89.0V SP ASC | INT16 | 1264 x 1328 | 89.0 GHz vertical daily average ascending TBs |
| 89.0V SP DSC | INT16 | 1264 x 1328 | 89.0 GHz vertical daily average descending TBs |
| 89.0V SP DAILY | INT16 | 1264 x 1328 | 89.0 GHz vertical daily average TBs |
| 89.0H SP ASC | INT16 | 1264 x 1328 | 89.0 GHz horizontal daily average ascending TBs |
| 89.0H SP DSC | INT16 | 1264 x 1328 | 89.0 GHz horizontal daily average descending TBs |
| 89.0H SP DAILY | INT16 | 1264 x 1328 | 89.0 GHz horizontal daily average TBs |

Table 13 AMSR-E Level 3 12.0 km Sea Ice Products

| Parameter | Data Type | Dimensions | Description |
|---|---|---|---|
| **NpPolarGrid12km** | | | |
| **Data Fields** | | | |
| 18.7V NP ASC | INT16 | 608 X 896 | 18.7 GHz vertical daily average ascending TBs |

| | | | |
|---|---|---|---|
| 18.7V NP DSC | INT16 | 608 X 896 | 18.7 GHz vertical daily average descending TBs |
| 18.7V NP DAILY | INT16 | 608 X 896 | 18.7 GHz vertical daily average TBs |
| 18.7H NP ASC | INT16 | 608 X 896 | 18.7 GHz horizontal daily average ascending TBs |
| 18.7H NP DSC | INT16 | 608 X 896 | 18.7 GHz horizontal daily average descending TBs |
| 18.7H NP DAILY | INT16 | 608 X 896 | 18.7 GHz horizontal daily average TBs |
| 23.8V NP ASC | INT16 | 608 X 896 | 23.8 GHz vertical daily average ascending TBs |
| 23.8V NP DSC | INT16 | 608 X 896 | 23.8 GHz vertical daily average descending TBs |
| 23.8V NP DAILY | INT16 | 608 X 896 | 23.8 GHz vertical daily average TBs |
| 23.8H NP ASC | INT16 | 608 X 896 | 23.8 GHz horizontal daily average ascending TBs |
| 23.8H NP DSC | INT16 | 608 X 896 | 23.8 GHz horizontal daily average descending TBs |
| 23.8H NP DAILY | INT16 | 608 X 896 | 23.8 GHz horizontal daily average TBs |
| 36.5V NP ASC | INT16 | 608 X 896 | 36.5 GHz vertical daily average ascending TBs |
| 36.5V NP DSC | INT16 | 608 X 896 | 36.5 GHz vertical daily average descending TBs |
| 36.5V NP DAILY | INT16 | 608 X 896 | 36.5 GHz vertical daily average TBs |
| 36.5H NP ASC | INT16 | 608 X 896 | 36.5 GHz horizontal daily average ascending TBs |
| 36.5H NP DSC | INT16 | 608 X 896 | 36.5 GHz horizontal daily average descending TBs |
| 36.5H NP DAILY | INT16 | 608 X 896 | 36.5 GHz horizontal daily average TBs |
| 89.0V NP ASC | INT16 | 608 X 896 | 89.0 GHz vertical daily average ascending TBs |
| 89.0V NP DSC | INT16 | 608 X 896 | 89.0 GHz vertical daily average descending TBs |
| 89.0V NP DAILY | INT16 | 608 X 896 | 89.0 GHz vertical daily average TBs |
| 89.0H NP ASC | INT16 | 608 X 896 | 89.0 GHz horizontal daily average ascending TBs |
| 89.0H NP DSC | INT16 | 608 X 896 | 89.0 GHz horizontal daily average descending TBs |
| 89.0H NP DAILY | INT16 | 608 X 896 | 89.0 GHz horizontal daily average TBs |
| ICE CONC NP ASC | INT8 | 608 X 896 | Sea Ice Concentration daily ascending average using the NT2 algorithm |
| ICE CONC NP DSC | INT8 | 608 X 896 | Sea Ice Concentration daily descending average using the NT2 algorithm |
| ICE CONC NP DAILY | INT8 | 608 X 896 | Sea Ice Concentration daily average using the NT2 algorithm |
| ICE DIFF NP ASC | INT8 | 608 X 896 | Sea Ice Concentration Difference (NT2 – Bootstrap) daily ascending average |
| ICE DIFF NP DSC | INT8 | 608 X 896 | Sea Ice Concentration Difference (NT2 – Bootstrap) daily descending average |
| ICE DIFF NP DAILY | INT8 | 608 X 896 | Sea Ice Concentration Difference (NT2 – Bootstrap) average |
| SNOW DEPTH NP 5 DAY | INT8 | 608 X 896 | 5-day snow depth |
| **SpPolarGrid12km** | | | |
| **Data Fields** | | | |
| 18.7V SP ASC | INT16 | 632 X 664 | 18.7 GHz vertical daily average ascending TBs |
| 18.7V SP DSC | INT16 | 632 X 664 | 18.7 GHz vertical daily average descending TBs |
| 18.7V SP DAILY | INT16 | 632 X 664 | 18.7 GHz vertical daily average TBs |
| 18.7H SP ASC | INT16 | 632 X 664 | 18.7 GHz horizontal daily average ascending TBs |
| 18.7H SP DSC | INT16 | 632 X 664 | 18.7 GHz horizontal daily average descending TBs |
| 18.7H SP DAILY | INT16 | 632 X 664 | 18.7 GHz horizontal daily average TBs |
| 23.8V SP ASC | INT16 | 632 X 664 | 23.8 GHz vertical daily average ascending TBs |
| 23.8V SP DSC | INT16 | 632 X 664 | 23.8 GHz vertical daily average descending TBs |
| 23.8V SP DAILY | INT16 | 632 X 664 | 23.8 GHz vertical daily average TBs |
| 23.8H SP ASC | INT16 | 632 X 664 | 23.8 GHz horizontal daily average ascending TBs |
| 23.8H SP DSC | INT16 | 632 X 664 | 23.8 GHz horizontal daily average descending TBs |
| 23.8H SP DAILY | INT16 | 632 X 664 | 23.8 GHz horizontal daily average TBs |
| 36.5V SP ASC | INT16 | 632 X 664 | 36.5 GHz vertical daily average ascending TBs |
| 36.5V SP DSC | INT16 | 632 X 664 | 36.5 GHz vertical daily average descending TBs |
| 36.5V SP DAILY | INT16 | 632 X 664 | 36.5 GHz vertical daily average TBs |

| 36.5H SP ASC | INT16 | 632 X 664 | 36.5 GHz horizontal daily average ascending TBs |
|---|---|---|---|
| 36.5H SP DSC | INT16 | 632 X 664 | 36.5 GHz horizontal daily average descending TBs |
| 36.5H SP DAILY | INT16 | 632 X 664 | 36.5 GHz horizontal daily average TBs |
| 89.0V SP ASC | INT16 | 632 X 664 | 89.0 GHz vertical daily average ascending TBs |
| 89.0V SP DSC | INT16 | 632 X 664 | 89.0 GHz vertical daily average descending TBs |
| 89.0V SP DAILY | INT16 | 632 X 664 | 89.0 GHz vertical daily average TBs |
| 89.0H SP ASC | INT16 | 632 X 664 | 89.0 GHz horizontal daily average ascending TBs |
| 89.0H SP DSC | INT16 | 632 X 664 | 89.0 GHz horizontal daily average descending TBs |
| 89.0H SP DAILY | INT16 | 632 X 664 | 89.0 GHz horizontal daily average TBs |
| ICE CONC SP ASC | INT8 | 632 X 664 | Sea Ice Concentration daily ascending average using the Bootstrap algorithm |
| ICE CONC SP DSC | INT8 | 632 X 664 | Sea Ice Concentration daily descending average using the Bootstrap algorithm |
| ICE CONC SP DAILY | INT8 | 632 X 664 | Sea Ice Concentration daily average using the Bootstrap algorithm |
| ICE DIFF SP ASC | INT8 | 632 X 664 | Sea Ice Concentration Difference (Bootstrap – NT2) daily ascending average |
| ICE DIFF SP DSC | INT8 | 632 X 664 | Sea Ice Concentration Difference (Bootstrap – NT2) daily descending average |
| ICE DIFF SP DAILY | INT8 | 632 X 664 | Sea Ice Concentration Difference (Bootstrap – NT2) average |
| SNOW DEPTH SP 5 DAY | INT8 | 632 X 664 | 5-day snow depth |

Table 14 AMSR-E Level 3 25.0 km Sea Ice Products

| Parameter | Data Type | Dimensions | Description |
|---|---|---|---|
| **NpPolarGrid25km** | | | |
| **Data Fields** | | | |
| 06.9V NP ASC | INT16 | 304 x 448 | 6.9 GHz vertical daily average ascending TBs |
| 06.9V NP DSC | INT16 | 304 x 448 | 6.9 GHz vertical daily average descending TBs |
| 06.9V NP DAILY | INT16 | 304 x 448 | 6.9 GHz vertical daily average TBs |
| 06.9H NP ASC | INT16 | 304 x 448 | 6.9 GHz horizontal daily average ascending TBs |
| 06.9H NP DSC | INT16 | 304 x 448 | 6.9 GHz horizontal daily average descending TBs |
| 06.9H NP DAILY | INT16 | 304 x 448 | 6.9 GHz horizontal daily average TBs |
| 10.7V NP ASC | INT16 | 304 x 448 | 10.7 GHz vertical daily average ascending TBs |
| 10.7V NP DSC | INT16 | 304 x 448 | 10.7 GHz vertical daily average descending TBs |
| 10.7V NP DAILY | INT16 | 304 x 448 | 10.7 GHz vertical daily average TBs |
| 10.7H NP ASC | INT16 | 304 x 448 | 10.7 GHz horizontal daily average ascending TBs |
| 10.7H NP DSC | INT16 | 304 x 448 | 10.7 GHz horizontal daily average descending TBs |
| 10.7H NP DAILY | INT16 | 304 x 448 | 10.7 GHz horizontal daily average TBs |

| 18.7V NP ASC | INT16 | 304 x 448 | 18.7 GHz vertical daily average ascending TBs |
|---|---|---|---|
| 18.7V NP DSC | INT16 | 304 x 448 | 18.7 GHz vertical daily average descending TBs |
| 18.7V NP DAILY | INT16 | 304 x 448 | 18.7 GHz vertical daily average TBs |
| 18.7H NP ASC | INT16 | 304 x 448 | 18.7 GHz horizontal daily average ascending TBs |
| 18.7H NP DSC | INT16 | 304 x 448 | 18.7 GHz horizontal daily average descending TBs |
| 18.7H NP DAILY | INT16 | 304 x 448 | 18.7 GHz horizontal daily average TBs |
| 23.8V NP ASC | INT16 | 304 x 448 | 23.8 GHz vertical daily average ascending TBs |
| 23.8V NP DSC | INT16 | 304 x 448 | 23.8 GHz vertical daily average descending TBs |
| 23.8V NP DAILY | INT16 | 304 x 448 | 23.8 GHz vertical daily average TBs |
| 23.8H NP ASC | INT16 | 304 x 448 | 23.8 GHz horizontal daily average ascending TBs |
| 23.8H NP DSC | INT16 | 304 x 448 | 23.8 GHz horizontal daily average descending TBs |
| 23.8H NP DAILY | INT16 | 304 x 448 | 23.8 GHz horizontal daily average TBs |
| 36.5V NP ASC | INT16 | 304 x 448 | 36.5 GHz vertical daily average ascending TBs |
| 36.5V NP DSC | INT16 | 304 x 448 | 36.5 GHz vertical daily average descending TBs |
| 36.5V NP DAILY | INT16 | 304 x 448 | 36.5 GHz vertical daily average TBs |
| 36.5H NP ASC | INT16 | 304 x 448 | 36.5 GHz horizontal daily average ascending TBs |
| 36.5H NP DSC | INT16 | 304 x 448 | 36.5 GHz horizontal daily average descending TBs |
| 36.5H NP DAILY | INT16 | 304 x 448 | 36.5 GHz horizontal daily average TBs |
| 89.0V NP ASC | INT16 | 304 x 448 | 89.0 GHz vertical daily average ascending TBs |
| 89.0V NP DSC | INT16 | 304 x 448 | 89.0 GHz vertical daily average descending TBs |
| 89.0V NP DAILY | INT16 | 304 x 448 | 89.0 GHz vertical daily average TBs |
| 89.0H NP ASC | INT16 | 304 x 448 | 89.0 GHz horizontal daily average ascending TBs |
| 89.0H NP DSC | INT16 | 304 x 448 | 89.0 GHz horizontal daily average descending TBs |
| 89.0H NP DAILY | INT16 | 304 x 448 | 89.0 GHz horizontal daily average TBs |
| ICE CONC NP ASC | INT8 | 304 x 448 | Sea Ice Concentration daily ascending average using the NT2 algorithm |
| ICE CONC NP DSC | INT8 | 304 x 448 | Sea Ice Concentration daily descending average using the NT2 algorithm |
| ICE CONC DAILY | INT8 | 304 x 448 | Sea Ice Concentration daily average using the NT2 algorithm |
| ICE DIFF NP ASC | INT8 | 304 x 448 | Sea Ice Concentration Difference(NT2 - Bootstrap) daily ascending average |
| ICE DIFF NP DSC | INT8 | 304 x 448 | Sea Ice Concentration Difference (NT2 – Bootstrap) daily descending average |
| ICE DIFF NP DAILY | INT8 | 304 x 448 | Sea Ice Concentration Difference (NT2 – Bootstrap) average |
| SFC TEMP NP ASC | INT8 | 304 x 448 | Sea Ice Temperature daily ascending average |
| SFC TEMP NP DSC | INT8 | 304 x 448 | Sea Ice Temperature daily descending average |
| SFC TEMP NP DAILY | INT8 | 304 x 448 | Sea Ice Temperature daily average |
| **SpPolarGrid25km** | | | |
| **Data Fields** | | | |
| 06.9V SP ASC | INT16 | 304 x 448 | 6.9 GHz vertical daily average ascending TBs |
| 06.9V SP DSC | INT16 | 304 x 448 | 6.9 GHz vertical daily average descending TBs |
| 06.9V SP DAILY | INT16 | 304 x 448 | 6.9 GHz vertical daily average TBs |
| 06.9H SP ASC | INT16 | 304 x 448 | 6.9 GHz horizontal daily average ascending TBs |
| 06.9H SP DSC | INT16 | 304 x 448 | 6.9 GHz horizontal daily average descending TBs |
| 06.9H SP DAILY | INT16 | 304 x 448 | 6.9 GHz horizontal daily average TBs |
| 10.7V SP ASC | INT16 | 304 x 448 | 10.7 GHz vertical daily average ascending TBs |
| 10.7V SP DSC | INT16 | 304 x 448 | 10.7 GHz vertical daily average descending TBs |
| 10.7V SP DAILY | INT16 | 304 x 448 | 10.7 GHz vertical daily average TBs |
| 10.7H SP ASC | INT16 | 304 x 448 | 10.7 GHz horizontal daily average ascending TBs |

| 10.7H SP DSC | INT16 | 304 x 448 | 10.7 GHz horizontal daily average descending TBs |
|---|---|---|---|
| 10.7H SP DAILY | INT16 | 304 x 448 | 10.7 GHz horizontal daily average TBs |
| 18.7V SP ASC | INT16 | 304 x 448 | 18.7 GHz vertical daily average ascending TBs |
| 18.7V SP DSC | INT16 | 304 x 448 | 18.7 GHz vertical daily average descending TBs |
| 18.7V SP DAILY | INT16 | 304 x 448 | 18.7 GHz vertical daily average TBs |
| 18.7H SP ASC | INT16 | 304 x 448 | 18.7 GHz horizontal daily average ascending TBs |
| 18.7H SP DSC | INT16 | 304 x 448 | 18.7 GHz horizontal daily average descending TBs |
| 18.7H SP DAILY | INT16 | 304 x 448 | 18.7 GHz horizontal daily average TBs |
| 23.8V SP ASC | INT16 | 304 x 448 | 23.8 GHz vertical daily average ascending TBs |
| 23.8V SP DSC | INT16 | 304 x 448 | 23.8 GHz vertical daily average descending TBs |
| 23.8V SP DAILY | INT16 | 304 x 448 | 23.8 GHz vertical daily average TBs |
| 23.8H SP ASC | INT16 | 304 x 448 | 23.8 GHz horizontal daily average ascending TBs |
| 23.8H SP DSC | INT16 | 304 x 448 | 23.8 GHz horizontal daily average descending TBs |
| 23.8H SP DAILY | INT16 | 304 x 448 | 23.8 GHz horizontal daily average TBs |
| 36.5V SP ASC | INT16 | 304 x 448 | 36.5 GHz vertical daily average ascending TBs |
| 36.5V SP DSC | INT16 | 304 x 448 | 36.5 GHz vertical daily average descending TBs |
| 36.5V SP DAILY | INT16 | 304 x 448 | 36.5 GHz vertical daily average TBs |
| 36.5H SP ASC | INT16 | 304 x 448 | 36.5 GHz horizontal daily average ascending TBs |
| 36.5H SP DSC | INT16 | 304 x 448 | 36.5 GHz horizontal daily average descending TBs |
| 36.5H SP DAILY | INT16 | 304 x 448 | 36.5 GHz horizontal daily average TBs |
| 89.0V SP ASC | INT16 | 304 x 448 | 89.0 GHz vertical daily average ascending TBs |
| 89.0V SP DSC | INT16 | 304 x 448 | 89.0 GHz vertical daily average descending TBs |
| 89.0V SP DAILY | INT16 | 304 x 448 | 89.0 GHz vertical daily average TBs |
| 89.0H SP ASC | INT16 | 304 x 448 | 89.0 GHz horizontal daily average ascending TBs |
| 89.0H SP DSC | INT16 | 304 x 448 | 89.0 GHz horizontal daily average descending TBs |
| 89.0H SP DAILY | INT16 | 304 x 448 | 89.0 GHz horizontal daily average TBs |
| ICE CONC SP ASC | INT8 | 304 x 448 | Sea Ice Concentration daily ascending average using the NT2 algorithm |
| ICE CONC SP DSC | INT8 | 304 x 448 | Sea Ice Concentration daily descending average using the NT2 algorithm |
| ICE CONC DAILY | INT8 | 304 x 448 | Sea Ice Concentration daily average using the NT2 algorithm |
| ICE DIFF SP ASC | INT8 | 304 x 448 | Sea Ice Concentration Difference  (NT2 - Bootstrap) daily ascending average |
| ICE DIFF SP DSC | INT8 | 304 x 448 | Sea Ice Concentration Difference (NT2 – Bootstrap) daily descending average |
| ICE DIFF SP DAILY | INT8 | 304 x 448 | Sea Ice Concentration Difference (NT2 – Bootstrap) average |
| SFC TEMP SP ASC | INT8 | 304 x 448 | Sea Ice Temperature daily ascending average |
| SFC TEMP SP DSC | INT8 | 304 x 448 | Sea Ice Temperature daily descending average |
| SFC TEMP SP DAILY | INT8 | 304 x 448 | Sea Ice Temperature daily average |

Table 15 AMSR-E Level 3 Sea Ice Ancillary Files

| File Name | Description | Type | Source | Volume (MB) |
|---|---|---|---|---|
| land_north_12.hdf | Land mask | Static | GSFC/ Cavalieri | 1.1 |
| land_north_25.hdf | Land mask | Static | GSFC/ Cavalieri | 0.3 |
| land_south_12.hdf | Land mask | Static | GSFC/Comiso | 0.8 |
| land_south_25.hdf | Land mask | Static | GSFC/Comiso | 0.2 |
| sp_jsector.msk1 | South pole sector mask | Static | GSFC/Comiso | 0.2 |

| sp_jsector.msk2 | South pole sector mask | Static | GSFC/Comiso | 0.8 |
|---|---|---|---|---|

Table 16. AMSR-E Level 3 Monthly Rainfall Product.

| Parameter | Data Type | Dimensions | Description |
|---|---|---|---|
| **RainfallAccumulations** | | | |
| **Data Fields** | | | |
| tamu_rain | INT16 | 36 x72 | TAMU monthly ocean rainfall accumulations derived from the Level 2A TBs |
| gsfc_ocean | INT16 | 36 x 72 | Monthly ocean rainfall accumulations derived from the Level 2B ocean rainfall |
| noaa_land | INT16 | 36 x 72 | Monthly land rainfall accumulations derived from the Level 2B land rainfall |

Table 17 AMSR-E Level 3 Monthly Rainfall Ancillary Files

| File Name | Description | Type | Source | Volume (MB) |
|---|---|---|---|---|
| Sfctype93.dbase | surface type data base | Static | GSFC / CSU Kummerow | 2.1 |
| Wilheit.dbase | Freezing level database | Static | TAM / Wilheit | 0.1 |

Table 18.  AMSR-E Level 3 Daily Land Product

| Parameter | Data Type | Dimensions | Description |
|---|---|---|---|
| **Ascending_Land_Grid** | | | |
| **Data Fields** | | | |
| Time | FLOAT64 | 586 x 1383 | Start scan time in TAI93 |
| TB06.9V (Res 1) TB06.9V | INT16 | 586 x 1383 | TB 06.9 GHz V at 6.9 GHz resolution |
| TB06.9H (Res 1) TB06.9H | INT16 | 586 x 1383 | TB 06.9 GHz H at 6.9 GHz resolution |
| TB10.7V (Res 1) TB10.7V | INT16 | 586 x 1383 | TB 10.7 GHz V at 6.9 GHz resolution |
| TB10.7H (Res 1) TB10.7H | INT16 | 586 x 1383 | TB 10.7 GHz H at 6.9 GHz resolution |
| TB18.7V (Res 1) TB18.7V | INT16 | 586 x 1383 | TB 18.7 GHz V at 6.9 GHz resolution |
| TB18.7H (Res 1) TB18.7H | INT16 | 586 x 1383 | TB 18.7 GHz H at 6.9 GHz resolution |
| TB36.5V (Res 1) TB36.5V | INT16 | 586 x 1383 | TB 36.5 GHz V at 6.9 GHz resolution |
| TB36.5H (Res 1) TB36.5H | INT16 | 586 x 1383 | TB 36.5 GHz H at 6.9 GHz resolution |
| TB36.5V (Res 4) TB36.5V | INT16 | 586 x 1383 | TB 36.5 GHz V at 36.5 GHz resolution |
| TB36.5H (Res 4) TB36.5H | INT16 | 586 x 1383 | TB 36.5 GHz H at 36.5 GHz resolution |
| TB89.0V (Res 4) TB89.0V | INT16 | 586 x 1383 | TB 89.0 GHz V at 36.5 GHz resolution |
| TB89.0H (Res 4) TB89.0H | INT16 | 586 x 1383 | TB 89.0 GHz H at 36.5 GHz resolution |

| Soil_Moisture | INT16 | 586 x 1383 | Soil moisture at 6.9 GHz resolution |
|---|---|---|---|
| Veg_Water_Content | INT16 | 586 x 1383 | Vegetation QC vegetation water content at 6.9 GHz resolution |
| Land_Surface_Temp | INT16 | 586 x 1383 | Land QC land surface temperature at 6.9 GHz resolution |
| Inversion_QC_Flag | INT16 | 586 x 1383 | Inversion quality control flag |
| | | | |
| **Descending_Land_Grid** | | | |
| **Data Fields** | | | |
| Time | FLOAT64 | 586 x 1383 | Start scan time in TAI93 |
| TB06.9V (Res 1) TB06.9V | INT16 | 586 x 1383 | TB 06.9 GHz V at 6.9 GHz resolution |
| TB06.9H (Res 1) TB06.9H | INT16 | 586 x 1383 | TB 06.9 GHz H at 6.9 GHz resolution |
| TB10.7V (Res 1) TB10.7V | INT16 | 586 x 1383 | TB 10.7 GHz V at 6.9 GHz resolution |
| TB10.7H (Res 1) TB10.7H | INT16 | 586 x 1383 | TB 10.7 GHz H at 6.9 GHz resolution |
| TB18.7V (Res 1) TB18.7V | INT16 | 586 x 1383 | TB 18.7 GHz V at 6.9 GHz resolution |
| TB18.7H (Res 1) TB18.7H | INT16 | 586 x 1383 | TB 18.7 GHz H at 6.9 GHz resolution |
| TB36.5V (Res 1) TB36.5V | INT16 | 586 x 1383 | TB 36.5 GHz V at 6.9 GHz resolution |
| TB36.5H (Res 1) TB36.5H | INT16 | 586 x 1383 | TB 36.5 GHz H at 6.9 GHz resolution |
| TB36.5V (Res 4) TB36.5V | INT16 | 586 x 1383 | TB 36.5 GHz V at 36.5 GHz resolution |
| TB36.5H (Res 4) TB36.5H | INT16 | 586 x 1383 | TB 36.5 GHz H at 36.5 GHz resolution |
| TB89.0V (Res 4) TB89.0V | INT16 | 586 x 1383 | TB 89.0 GHz V at 36.5 GHz resolution |
| TB89.0H (Res 4) TB89.0H | INT16 | 586 x 1383 | TB 89.0 GHz H at 36.5 GHz resolution |
| Soil_Moisture | INT16 | 586 x 1383 | Soil moisture at 6.9 GHz resolution |
| Veg_Water_Content | INT16 | 586 x 1383 | Vegetation QC vegetation water content at 6.9 GHz resolution |
| Land_Surface_Temp | INT16 | 586 x 1383 | Land QC land surface temperature at 6.9 GHz resolution |
| Inversion_QC_Flag | INT16 | 586 x 1383 | Inversion quality control flag |